RAILROAD GAZETTE

FRIDAY, JULY 5, 1901.

CONTENTS

ILLUSTRATED:
The Master Car Builders' Reports 470
New Roundhouse of the Pittsburgh & Lake Erie Railroad 482
Atlantic Type Locomotives for the Long Island Railroad 483
The "Cincinnati" Air Compressor for Railroad Shops 484

CONTRIBUTIONS:
Practical Tonnage Rating 475

EDITORIAL:
To Raise the Efficiency of the Air Brake 486
Editorial Notes 486
New Publications 488

MISCELLANEOUS:
The Master Car Builders' Convention 475
The Railroads of the Cape of Good Hope 482
Safety of Employees in England 482
Low-Price Weekly Tickets in Europe 482
The Telephone in Railroad Service 483
The National Metal Trades Association and the Machinists' Strike 484
To Test the Efficiency of a Car Service Association 485
Report on Steam Turbines 485
American Bridges in India 485
Metropolitan District (London) 485
At the Outset of the Engineers' Career 486

GENERAL NEWS:
Technical 488
The Scrap Heap 489
Locomotive Building 490
Car Building 490
Bridge Building 490
Meetings and Announcements 491
Personal 491
Elections and Appointments 491
Railroad Construction 491
General Railroad News 492

Contributions

Practical Tonnage Rating.

Roanoke, Va., June 25, 1901.

TO THE EDITOR OF THE RAILROAD GAZETTE.

Mr. Henderson's communication on "Practical Tonnage Rating" in your issue of June 21, taken in connection with the writer's formula published in the *Railroad Gazette* of Nov. 30, 1899, forms a check on both systems of calculations. For instance, if it be desired to find how many tons his standard 10-wheel engine can take up a 21-ft. grade at a steady pull we can use his diagrams; or, as seems to the writer more easy, substitute the known values in formula VIII. of Nov. 30, 1899, which is:

$$T = \frac{3\,DL\left(\frac{1}{S_1+10}+\frac{1}{S_2+10}\right)}{1.5\,RL+30\,GL-(S_1^2-S_2^2)} \quad \text{VIII.}$$

Here $D = 100{,}000$ $R = 6$
$S_1 = 5$ $L = 1$
$S_2 = 5$ $G = 0.4$

Substituting and reducing we get $T = 1{,}905$, or, less engine and tender, 1,775, as compared with Mr. Henderson's 1,750 tons.

If it be desired to find how many tons can be taken up a 34-ft. grade, 9,000 ft. long, the initial speed being 35 miles an hour and the final speed 5 miles an hour, we have, using formula VIII.

$D = 100{,}000$ $R = 7$
$S_1 = 35$ $L = 90$
$S_2 = 5$ $G = 0.65$

This gives $T = 1{,}600$ or, subtracting the weight of engine and tender, 1,470 tons, as compared with 1,450 found by Mr. Henderson.

In the above examples of the use of formula VIII the weight on drivers of the engine has been taken as being 100,000 lbs. This was done because the typical engine used by the writer in the preparation of this formula was assumed to be able to exert a traction of 25 per cent. of its driving wheel weight at 6 miles an hour, which does not appear excessive, whereas the maximum traction of the engine under consideration is only 21.2 per cent. of its driving wheel weight at slowest speed.

CHARLES C. WENTWORTH,
Bridge Engineer Norfolk & Western Ry.

Master Car Builders' Convention.

The thirty-fifth annual meeting of the Master Car Builders' Association was opened Monday morning, June 24, at Saratoga, N. Y. After the opening prayer, a message from the Governor of New York was read expressing his regrets at not being able to be present and welcome the convention in person. Mr. A. P. Knapp, President of the village of Saratoga, addressed the meeting, and was followed by President Chamberlain (Boston & Maine). The following are extracts from the President's opening address following a review of this year's reports:

PRESIDENT'S ADDRESS.

The demand for larger capacity cars does not seem to diminish, but, on the contrary, the larger railroads doing a heavy through business seem to be satisfied that no mistake was made in advocating the 80,000 lbs. capacity cars. So far as I am able to learn, the roads having on their line large quantities of coal or iron, or both, have had constructed, and are still continuing to construct and use 100,000 lbs. capacity cars, and are satisfied that there is economy in their use for the special heavy freight referred to. This Association is to be congratulated in having taken steps to make successful the construction of such equipment. I cannot but call your attention to the reports of the inspectors employed by the Inter-state Commerce Commission, setting forth the fact that a considerable number of cars equipped with M. C. B. couplers have defects which render the uncoupling inoperative. That a better state of things can be accomplished, there is no doubt, if the railroads would make a special effort in looking after and promptly repairing all defects that come under the notice of the car inspector, not only as regards the coupler and all its parts, but also as regards all other safety appliances to the car, including the air-brakes. Most of the defects mentioned are slight, and the delay to freight would be comparatively small were the repairs made promptly. This would reduce to a great degree the number of defective cars reported, and I earnestly recommend that this matter receive your prompt, individual attention.

It has come to be an unwritten law that if your presiding officer does his business to the satisfaction of the members he is given a second term, and while I consider the honor of being your President as the greatest ever bestowed upon me, I feel it is for the best interest of this Association that you allow me to retire with the close of the present term. This is for the reason that your official office being in Chicago where it properly belongs, handicaps one in a position like myself by not being in close touch with matters which are liable to need prompt attention, and correspondence is not always satisfactory. My position in Boston makes it very hard for me to satisfy myself that I am giving all the attention as President that this Association deserves, and with that feeling in view, and none other, I hope you will take such action as will lead to the selection of my successor during this convention.

In his report the Secretary announced the death during the past year of John Hodge, M. M. Martin, Charles Graham, E. La Lime, Job H. Jackson and Clem Hackney. The total membership is now 483, and the total number of cars represented is 1,505,622, or an increase over last year of 148,761 cars. The Treasurer reported a balance on hand of $9,590.48.

The convention then proceeded to the discussion of the revision of the Interchange Rules and the remainder of Monday's session was so spent. No radical changes were made, but an important action was to increase the price for maintaining air-brake equipment. The price for cleaning triple valves was raised from 10 to 20 cents, and the price for cleaning brake cylinders was raised from 15 to 20 cents. The present price for retaining valves, 15 cents, was not changed. This air-brake work will now be done at a small profit, and it is expected that the larger prices will result in better maintenance of air-brakes.

ELECTION OF OFFICERS.

The following officers were elected to serve during the ensuing year: President, J. J. Hennessey, Chicago, Milwaukee & St. Paul; First Vice-President, J. W. Marden, Fitchburgh R. R.; Second Vice-President, F. W. Brazier, New York Central & Hudson River; Third Vice-President, W. P. Appleyard, New York, New Haven & Hartford, and Treasurer, John Kirby, Lake Shore & Michigan Central. Mr. J. W. Taylor was reappointed Secretary, and the following new members of the Executive Committee were elected: T. W. Demarest, Pittsburgh, Cincinnati, Chicago & St. Louis; W. Renshaw, Illinois Central, and J. T. Chamberlain, Boston & Maine. The members of the Executive Committee holding over from last year are: E. D. Bronner, Michigan Central; J. H. McConnell and W. Apps, Canadian Pacific.

TRIPLE VALVE TESTS.

(*See Railroad Gazette, June 28, page 457.*)

Mr. G. W. Rhodes, Burlington & Missouri River—I would like the Secretary to note a correction. Under the item "Test No. 10," the committee would like the Secretary to make it read "Meets requirement," and to erase the words "As far as quick action is concerned, but failed in the time requirement." I do not know how it got in there. It was evidently done by the committee, but it was an error. The triple valve in test No. 10 meets the requirements in every respect.

You will find nine different claims submitted by the owners in regard to their valves. The committee did not indorse these claims in any way, but it thought it would be interesting to the Association to know what the manufacturers claimed for their devices. I want to call special attention to the jumping test, where it is shown that more cars can be jumped at the rear end of the train than the front end. I do not know that it is an advantage. Some would claim it is a disadvantage, that if we had a good many cars at the end of the train that can be jumped, it might result in so many being cut out and put at the rear end that it might bring about some break-in-twos. It is a fact that while a number can be jumped at the rear end, a great many at the middle and the front would be affected. You can jump six, seven or eight cars if located at the rear end of the train, which cannot be accomplished if they are in the front end of the train.

With reference to disc tests, every time we overhaul a triple valve I believe that the service feature of the valve should be tested to see whether it has this range from 2-64 to 10-64 without any evidence of quick action. I believe also we should make the quick action test and see whether we get the quick action fully in from 11-64 to 14-64. We should also test the charging quality of the triple valve to see if it charges the auxiliary reservoir to 55 lbs. I believe these things are very necessary, and that the action of the Association yesterday on the subject of the cost of cleaning triple valves was a wise one. In the case of the small ports of the triple valve, the scraping of these ports and parts may get them open so that they will not conform to our requirements, and if we do not give time to test these features of the valve, we are apt to drift away from our proper standards which long experience has warranted us in adopting.

There was no discussion of the report.

LABORATORY TESTS OF BRAKE SHOES.

(*See Railroad Gazette, June 28, page 458.*)

Mr. S. P. Bush—The committee was instructed to make a test of brake shoes that might be presented by railroads. We have taken most of the brake shoes out of the stock of the railroad companies. The committee does not know where the brake shoes came from; they know what railroads they came from, but that is all. In the case of two of the shoes the committee presented them as coming from the committee. The shoes known as the Lappin and the Cardwell were presented direct to the Chairman of the committee, and he presented them as coming from the Chicago, Milwaukee & St. Paul road. The Chicago, Milwaukee & St. Paul road are not using them. I will say, further, that the manufacturers of the shoe designated as the Lappin shoe do not desire this shoe to be considered as their regular shoe, as it is a softer shoe, and made according to a different plan. The shoe which was tested is different from the regular Lappin shoe.

In the matter of specifications, the committee recommends that some influence be used on the part of the association to counteract the tendency that has existed for some time past to use brake shoes that give very low wear and very small friction, and in preparing the specifications the committee had this point in view. Since coming to the convention, the committee has had a good deal of conversation on the subject, and it is inclined to believe that the specifications as shown in the report offer a little bit too much influence in the direction of high friction, in that it might eliminate, if everybody followed the specifications, some shoes that really must be used at the present time. For instance, it would eliminate the use of the hard cast iron shoe under certain conditions. For instance, the hard cast iron shoe would be barred at 40 miles an hour, under a pressure of 6,800 lbs., and as this shoe has been used for many years, and will be used for many years to come, the committee hardly feels justified in taking the position to bar that shoe under any circumstances, so it recommends a change in the specification as follows:

40 miles an hour, 22 per cent. at a pressure of 2,808 lbs.
40 miles an hour, 20 per cent. at a pressure of 4,152 lbs.
40 miles an hour, 16 per cent. at a pressure of 6,850 lbs.

The above are the specifications for chilled wheels. That specification will bar out all shoes that have an excessive amount of chill in them. It will bar out shoes that stay on the brake-beams a very long time, and do not do very much braking.

In the case of a steel tired wheel, the committee feels that it might be better to make a change, and make the basis of the specification a speed of 65 miles an hour instead of 40 miles an hour, for the reason that most of the work with cars which have steel tired wheels, is done under conditions of higher speeds. It is a usual occurrence in passenger service to-day to commence the operation of the brake at a speed of 65 miles an hour. We therefore recommend the specifications for steel tired wheels be as follows:

40 miles an hour, 16 per cent. at a pressure of 2,808 lbs. pressure.
40 miles an hour, 14 per cent. at a pressure of 4,152 lbs. pressure.
40 miles an hour, 12 per cent. at a pressure of 6,850 lbs. pressure.

In regard to the action of the various shoes under the test there are some things the committee feels it can speak of with safety. One is that increasing the quantity of chilled iron decreases the coefficient of friction. That seems to be demonstrated all the way through. There is a difference, however, in the manner of applying the chilled iron in the shoe. In some cases it is done by simply chilling the face of the shoe itself. In other cases it is done by applying a chilled insert. If you will examine the diagrams you will find that here is a difference, particularly in the case of steel tired wheels, in the coefficient of friction, although there may be approximately the same amount of chilled iron. In the case of the chilled iron inserts, where the edge of the chill of the insert runs either directly across or diagonally across, or in the form of an irregular curve, it changes the action, and it has been thought possible there was a slight cutting action. It will be observed that such a shoe operates differently on a chilled wheel. The coefficient of friction is not nearly so high on a chilled wheel, but on a steel wheel it seems to be able to perform a certain amount of work of cutting. Whether that cutting action would be objectionable, the committee is not prepared to say. It is a fact that such shoes are used on steel tired wheels to a greater or less extent at the present time.

The question might be asked, Why not use the soft

cast iron shoe? The reason is that the wear of a soft cast iron shoe is so great that it is not practicable to use it under many conditions. You could not make continuous runs, several thousand miles, with a soft cast iron shoe; you have to change the shoe. In addition, it means a more frequent adjustment of the brakes, which cannot be well done with trains in transit, so it is hardly a practicable shoe to use.

The other point is that we have mentioned here the names of the manufacturers of the shoes. They all know where they stand. As far as these particular shoes are concerned, the impression should not go out among the members of the Association that what the report gives here as the coefficient of friction, of the Lappin, Streeter, or any other shoe, is necessarily what the friction must be of the shoes. Take the two tests of the Cardwell shoes. The two Cardwell shoes came from the same lot of shoes, they were selected at the same time, and yet there is a very considerable difference in the coefficient of friction. Take two Corning, two Streeter, or two Sargent shoes, and if the shoes were made at different times, you might get different results. The fact of the matter is in many respects the manufacturer has it entirely within his control to produce what is wanted, and no injury should be done any manufacturer in presenting these names, simply because some of them happened to be low on the list. It should not be understood that they cannot produce what may be desired for service.

Mr. Pulaski Leeds, Louisville & Nashville.—I move that the Association receive the report and that the specifications presented be referred to letter ballot for adoption as standards. Carried.

TESTS OF M. C. B. COUPLERS.

(*See Railroad Gazette, June 28, page 460.*)

Mr. T. Fildes, Long Island R. R.—The committee recommends that a worn coupler gage be used. I have been experimenting with gages for the last three years, and have come to the conclusion there is one essential distance to be measured; the distance from the edge of the knuckle to the guard, 5¼ in. With this gage which we have adopted as recommended practice, whenever you have a break-in-two the instructions are to either renew the knuckle, the knuckle pin or the lock, as necessary. After you have done that, then you try your gage. The same thing can be done with a straight piece of steel of 5¼ in. in length, which can be made and sent out to inspectors, and costs probably 10 cents.

Mr. W. W. Atterbury, Pennsylvania R. R.—The straight gage the gentleman speaks of will control a large number of worn couplers—that is, as to the particular point of dimensions from the edge of the knuckle to the guard arm. This is a serious point of wear, because it is liable to cause the knuckle to uncouple, but there are combinations of wear in the various points which are just as disastrous as the swinging of the knuckle or the swinging of the guard arm. The worn coupler gage which the committee has worked out covers all the various possible combinations of wear, and it is for that reason that the committee recommended its use.

Mr. R. P. C. Sanderson—This matter of the strength of couplers became a very important one on the road with which I was lately connected, and it became my duty to make a very thorough investigation. I was led to believe, as the result of some close personal attention to the matter, that the breakage of couplers was not so much due to the absence of sufficient strength as to the improper form of the coupler. The way this first came to my attention was this: At a small repair yard I was watching a 16 x 24-in. switch engine pull a single empty side dump car off the rip track that had just had a new coupler put in, and that coupler was pulled in two. The material was good. It was not broken by the tension strain, but the head was wrenched off, and the reason for it was this: The back of the engine was equipped with a cast steel home-made coupler with a swinging head and fixed shank. The lines were incorrect. In going further into the matter I found that the scrap piles of broken couplers were more extensive in the neighborhood of lines having sharp curves than were justified by the grades or the service. Those two things put together led me to infer that the matter was worthy of further investigation, and I went at it on these lines. I got a number of couplers of standard makes and examined them first of all with the standard contour gage and the wear limit gage. I found that a number of the couplers had been made so that they did not correspond with the contour lines correctly. Some of them due to the carelessness were not properly made. In other cases the lines had been deviated from purposely with the object of giving greater strength and wear. Now we put these couplers together in pairs, first of the same kind, subsequently in different combinations, and measured them carefully to see what angle the couplers would swing to freely without resistance. The M. C. B. lines, if correctly followed in the coupler, will allow a coupler to swing to an angle of 14 degrees on either side. We found that in many cases the couplers would not swing more than 2½ degrees from the straight line. The angles were 2½; 6½ was quite common; 7 and 9 was common, and some few of them went to 13 and 12 degrees, but those couplers that went that far were very loose to the lines. We condemned with the worn coupler gage brand new couplers which were thus practically worn out before they were ever put in the car. That shows the importance of sticking close to the lines for that reason.

Having ascertained how much angle the couplers would go to naturally, we then placed them in the testing machines with the ends of the shanks resting on two blocks. The couplers were interlocked just as they would be in service, were allowed to fall as much as they would naturally, and then we put a heavy yoke over them the proper distance apart, to correspond with the two carrier irons of the car. We then forced them down by degrees to the angles they should go to. To show what that means, I will read some of the pressures that were necessary to bring the couplers down to the angle required by the M. C. B. lines: 5,000 lbs., 20,000, 19,000, 17,000, 16,000, 30,600, 28,000, 3,600, 9,000, 65,000, 58,000, 21,000, 22,000, 47,000, 10,500, 16,600, 33,700, 3,300, 29,000, 14,000, 18,500, 33,000 lbs. and so on.

Now that angle of 14 degrees is more than the couplers are required to swing to in ordinary railroad service, but the pressure required to put the angle down to a 10 grade curve is very serious, in many cases running over 12,000 lbs. and some as high as 15,000 lbs. on the different combinations. I would like to call attention to that because it means worn rails, bursted draft gears, split draft timbers, damaged carry irons, worn wheel flanges and increased tractive resistance in the train. I want to call attention to the necessity of insisting at all times that the lines shall be strictly lived up to. I want to go further and say that in some of these couplers that had been strained in this way the knuckle-pins were bent and the guard arms forced open nearly ⅛ in., and the faces of the couplers were cracked. Some of these were put in the drop test and given the guard arm test, and went to pieces at one blow; good steel couplers. Now, if you will stop to think what that means in service. The cars are wrenching the couplers in service, then when they get a small pull the coupler will break. It led me to believe that perhaps we did not need to increase the cost of the couplers by increasing the weight of the shanks and putting more material in them, but first to be sure we had the lines right and that the couplers were not damaging themselves. Another thing which led me to that was that in making the drop test the failures of the couplers principally were on jerk tests, and not on the drop tests. Now, if the couplers are failing principally by jerks, what is the use of strengthening that portion which is already more than strong? If the knuckles are going to break in the jerk test, if the knuckle pins are going to break in the jerk test and the lugs are going to break off in the jerk test, and you cannot strengthen those on the present contour lines, what is the use of putting the strength in the back which is already more than strong?

Mr. W. W. Atterbury—Mr. Sanderson has been of great value to the committee in its work, and he has given the subject a great deal of consideration. I think the committee appreciates it, and I am sure the association does. He very properly brought up the question of the necessity of following closely the M. C. B. lines on the couplers. You will find almost every coupler bears the stamp of the maker. And some little peculiarity, a wart here or a wart there, while not preventing the use of the coupler in interchange, prevents the perfect curving of the couplers on sharp curves, so that I certainly hope the Association will take Mr. Sanderson's thoughts seriously, so that we may have the M. C. B. lines of the coupler more perfectly followed out.

Mr. J. J. Hennessey, Chicago, Milwaukee & St. Paul—I have been looking into the failures of couplers considerably to see what is the cause. We had to reject a number of couplers, although the knuckle was worn but very little, and I think if we investigate carefully we will find there are more couplers condemned on account of the faulty knuckle pivot pins than for any other reason. In drawing them out of the sand many of the molders do not ream them out; they drift them out, and when the pins are first placed in the coupler they are quite tight, but bear only on the bottom and top. After the coupler is in service a little while the pin is 1-16 to ⅛ in. smaller than the hole, and allows the knuckle to swing out so far that you lose your contour lines. I think this is a matter worthy of close consideration, and the coupler makers should have their attention called to reaming out these holes.

Mr. C. A. Schroyer, Chicago & Northwestern—I believe in the importance of the use of the worn coupler gage. Reports are sent by our Superintendents of every train separation which takes place on the road and the causes reported as fully as the trainmen are able to ascertain them. As a result of the increased number of train separations we have put into use in all our important repair yards the M. C. B. defect coupler gage. We have to make repairs to a vast number of couplers, remove knuckles on account of being worn, and on account of the rim of the knuckle bearing against the locking block. We remove the locking blocks on account of being worn in the pivot pin hole. We remove a coupler because of a short guard arm, and by carrying out this practice we hope to be able to prevent in a large measure the uncoupling of cars. We think it important to oil the face of couplers to enable them to couple easily. It is not always the locking block which causes the knuckle to work hard, but the knuckle sometimes bears in the throat of the circle near the pivot pin hole, and will not go together unless a hard shock is given. We believe from the fact that the knuckles do not lock easily the coupler receives more severe handling on that account. We take the worn out waste from the boxes in the repair yard and squeeze the oil out and use it for that purpose, putting it in with a brush and getting good results. In regard to the points brought forward by Mr. Sanderson, we took up that question and determined the pressures occasioned by lateral motion of the cars rounding curves between long and short cars. The side motions of these cars produce pressures sidewise on the coupler of from 3,000 to 57,000 lbs. on our longest cars. That was done by making the carrier iron wider than the ordinary carrier iron, and filling up the space between the stem of the bar and the carrier iron with a lead block, and we found the compression in the lead block was 5-16 in. We afterwards put the mate of the lead block under the testing machine, and found it required 57,000 lbs. to compress the block to the same extent it had been compressed on the car. We realize the importance of giving our cars some lateral motion.

I move that the specifications of the committee on M. C. B. couplers be submitted to letter ballot. Carried.

SUPERVISION OF THE STANDARDS AND RECOMMENDED PRACTICE.

(*See Railroad Gazette, June 28, page 459.*)

Mr. G. W. Rhodes—I will ask if the standard of the Association for journal boxes in large cars is a round box, and if it is, whether there are any ribs in the bottom of the box to prevent the waste moving?

Mr. A. M. Waitt, New York Central & Hudson River—The standard for journal boxes does not specify whether the shape shall be round or square. It is optional, so long as the general dimensions are maintained. There are no provisions in the interior of the box in the way of ribs to prevent the waste moving around.

Mr. G. W. Rhodes—I have seen boxes in service that claim to be the M. C. B. standard, and I think a few years ago, when we discussed the shape of the box, there were many who advocated a round box. Recent investigation has developed the fact that our freight car equipment requires not more oil, but more attention. It has been noticed especially with our fast freight equipment that when a train leaves a terminal and makes a run of from 100 to 150 miles, you will find the waste has all moved in the direction in which the journal has been revolving. We want a man to go with a packing iron and put the waste which has accumulated in the side of the box, back where it belongs under the journal. Many of us who have found that out, realize that a rounded box under a freight car is a wrong construction. We want a box with a base shaped in such form that it will hold the waste there and not allow the waste to leave the bottom of the box.

REVISION OF RECOMMENDED PRACTICE FOR SPRINGS.

(*See report on page 480 of this issue.*)

Mr. F. H. Clark, Chicago, Burlington & Quincy—In regard to the large sized bars shown on springs E, F and G. They are considerably larger than any bars ordinarily used, and I have understood that a bar 1¼ in. in diameter was about as large as the spring manufacturers could temper. That they could not temper a bar of larger diameter. Was that point raised in the correspondence had with the makers of springs?

Mr. C. Lindstrom, Chicago & Alton—Bars up to 1½ in. have been used for many years, and while you cannot temper a large bar as well as one of smaller dimensions, it is not a serious objection. It is done by spring makers. We do not see our way clear to using springs with less size of bars, especially with the pedestal type of truck.

The recommendations of the committee were referred to letter ballot for adoption as recommended practice.

CAST IRON WHEELS.

(*See Railroad Gazette, June 28, page 459.*)

Mr. J. N. Barr, Baltimore & Ohio—The report is confined entirely to the subject your committee was instructed to report on which is given in the first paragraph, and that is to investigate and report on the question of locating the inner face of cast iron wheels to the gage point, and the thickness of metal between the bore and ring core, and to recommend minimum weights for wheels for use under 60,000, 80,000 and 100,000-lb. capacity cars.

I will add a few words more to our report. The railroads of this country have been buying wheels made with a very high percentage of old wheels, and for the last ten years or more the remelting of old wheels has continued until to-day, I have no doubt, there are wheels running composed to a large extent of material which has been remelted a dozen times, and we are approaching a time when this practice must be stopped or we shall have disastrous results. Ten years ago there were plenty of old wheels of practically as good quality as the majority of the new metal which is used to-day, if not of a better quality, but I want to say that this practice of using inferior new metal and remelting the old metal is bringing us to a point where the question has become serious. I believe the Association should take up the question of the material used in our wheels.

Mr. W. Garstang, Cleveland, Cincinnati, Chicago & St. Louis—I cannot concur in the recommendation to change the flange, as the change is at a point that does not seem to be of particular benefit to the wheel, and at the same time would throw out all existing gages and make the cast iron wheels under one particular class of cars have a different shape flange from the locomotive, passenger cars and cars of lighter capacity in the same service. As the flange was not a part of the subject assigned to the committee, we may all be out of order in mentioning it.

1st—Locating the inner face of hub to the gage point: I cannot concur in the recommendation of the committee to change the dimensions at this point from the present

standard. While the change recommended is only 1-16 in., I believe it to be a sixteenth in the wrong direction, if any change is made at all, but as the many thousand wheels now in service have the hubs set 1 in. and 2½ in. respectively from face of wheel, and a standard axle has been adopted with turning points to meet these dimensions, I do not think they should be changed.

2d—The thickness of metal between bore and ring core: The recommendation of 1 1-16 in. of metal at this point throws a thin plate between the two heaviest parts of the wheel, and the shrinkage strain is often to check the wheel at this point. Wheels that are cracked or weakened do not make as good a fit on the axle, and are not as easy to fit. I am of the opinion that this dimension should be limited to not less than 1¼ in., but do not consider it a question of vital importance.

3d—Minimum weights for wheels for use under cars of 60,000, 80,000 and 100,000 lbs. capacity: It seems to me that this is far the most important question to be decided, and one that should be most carefully considered. It has only been a few years since we all used wheels of 550 lbs. or less under our cars, the capacity of which seldom exceeded 50,000 lbs. In changing to the cars of larger capacity, the lighter wheel gradually gave way to one weighing about 600 lbs. This change was made, in most cases, because the 550-lb. wheel was developing defects under the heavier cars. We might advance as the first argument that we may expect the same defects to develop in the 600-lb. wheel if put under cars of 80,000 and 100,000 lbs., and especially so, as the average load is not only greater, but the average speed is greater also, which means more and longer application of the brakes, with a very much greater braking power, due to the adoption of air.

4th—As the committee well says, it is entirely out of the question to regulate the quality of material used in the manufacture of wheels for this larger equipment; it is therefore necessary to use a sufficient quantity in an approved design to feel reasonably certain that the wheels so made will not fail in service from structural weakness. I think it is questionable whether the average wheel maker will be willing to give a guarantee equal to what we are now receiving on wheels if no heavier weight is used under cars of greater capacity, and as many of us are not provided with the elaborate testing plants or facilities afforded other roads for making our own tests, we have to rely entirely on the wheel maker's guarantee and such test as we can make at their plant. Therefore, the length of the guarantee is a very important factor, and, from a financial standpoint, if no other, must be taken into consideration. If an additional 50 cents to the original cost, with a 25-cent rebate for scrap, will give us from one to two years additional guarantee on the wheels, and at the same time give us a wheel that we all feel must be a little better, I must strongly advocate the additional weight.

Basing our opinion on past experience I would recommend wheels for 60,000-lb. cars, 590 lbs.; 80,000-lb. cars, 640 lbs.; 100,000-lb. cars, 680 lbs.; with a minimum of 580 lbs. for 60,000-lb. cars; 630 lbs. for 80,000-lb. cars; 670 lbs. for 100,000-lb. cars.

Mr. J. W. Marden, Fitchburgh R. R.—I agree with Mr. Garstang. On the Boston & Maine system on our 80,000 lbs. car we have nothing less than 630-lb. wheels, and most of them at present at 650-lb. wheels, and we are not using under any class of car a wheel weighing less than 600 lbs. I notice that the difference allowed in the application of wheels for repairs on 600-lb. wheels is 25 lbs. I think if a wheel of 575 lbs. is recommended to be right for that weight of car we should not allow a weight of wheels to be put under our cars at repair points less than the difference in weight allowed by the makers. If we do that, it will not be a great while before we have a large number of our heavy weight cars running on lighter weight wheels than is really recommended for use under them.

Mr. L. T. Canfield—I think these minimum weights are too light. We have on our line a 600-lb. wheel for 60,000-lbs. capacity cars and cars under that capacity. For 80,000-lbs. capacity cars we have a 650-lb. wheel and for 100,000-lbs. capacity car we have a 700-lb. wheel. In adding the metal, we have not done it by plastering it onto various points in the pattern, but have tried to distribute it where it was needed most. We have increased the metal between the hub, increased the diameter of the hub a little and increased the thickness of the plates between the core and the outer portion of the wheel. We think it is necessary to have a heavier wheel even than what is recommended by the committee.

Mr. J. N. Barr—I ask how these wheels failed? If they were induced to go to heavier weights, what caused the wheels formerly used to fail? If we are to go to the use of 700-lb. wheels there should be some reason given for it, and why the wheels of lesser weight have not served the purpose?

It seems to me the matter already mentioned of remelting wheels over and over again until the material is utterly unfit to put into a wheel, is probably at the bottom of this movement. I think the wheel makers recognize that the wheels they are giving us are rather poor. I believe that the principal recommendation for this increase in weight came from the wheelmakers. I should like to know in what respect the 650-lb. wheel has failed, or the 600-lb. wheel has failed, making it necessary to go to the 700-lb. wheel?

Mr. L. T. Canfield—Our reason was that we had quite a number of 650-lb. wheels burst over the wheel fit due to getting them on the axle at sufficient pressure to hold them. In addition, we had breakages through the plates, and we thought it was necessary to strengthen all around the hub to get the wheel on the axle tight enough to hold it.

Mr. W. Garstang—We have had similar experiences to Mr. Canfield, and have had a number of wheels crack in the plate, and many brackets crack. We are not a mountainous road, and the continuous use of air-brakes is seldom put in practice. I fully agree with what Mr. Barr has said that the wheels are getting poorer. There is another point not touched on, and that is the thickness of the plates. The committee recommends that the plates be ¾ in., or at least it shows this in the cuts. I think we ought not to have less than ⅞ in. thickness of plates for wheels of 80,000 and 100,000 lbs. cars. I also think the bracket cuts an important feature as to the durability and service of the wheel. I find that the bracket measures about ⅞ in. at the outer edge, and my opinion is that it should be a 1⅛ in., where it connects with the plate, using a very large fillet about ¾ in. radius at the base, which makes a very strong wheel. I think the bracket should extend out as far as possible to the inner face of the flange, and I believe also it should extend down on to the plate below the intersection of the inner and outside plates, as I learned from the wheel makers that the intersection of the two plates is really one of the weakest points about the wheel, on account of excess dirt, etc., accumulating at that point.

Mr. J. J. Hennessey—There are other things to take in consideration besides the weight of the wheel. Mr. Canfield says that his wheels burst in mounting them, when he tried to get the required pressure. There must have been something wrong with the material of which the wheels were made. In inferior material there is no elasticity, and consequently inferior material is bad to put into the wheel, even if the wheel weighs 800 lbs. There are certain limits you cannot increase. How will you increase your flanges? There is a recommendation, I believe, to make the flanges ⅛ in. heavier. That would affect the guard rails and frogs and many other things. We have to go pretty slow on this matter. Every 25 lbs. you put into the wheel you must multiply by eight, and you are carrying around through the country during the life of the wheel that much dead weight. I think that should be taken into consideration. We have run 500 and 560-lb. wheels under 60,000-lbs. capacity cars for the last fifteen years, and I have never known a single wheel to fail on the whole St. Paul system. Cannot the railroads of this country insist on good material, and not let the wheel manufacturers build up an enormous amount of weight in the wheel and use any material they want to in the wheel?

Mr. J. W. Marden—I believe fully that the proper distribution of iron in the wheel will make a difference in its strength, and that a 650-lb. wheel may not be so strong and durable under service as a 550-lb. wheel. We had sprung upon us suddenly the 80,000 and 100,000-lbs. capacity cars, and we did not take the time to properly test in practice the weight of wheels which should be put under these cars. We have doubled up in our capacity, but we have not doubled the weight of the wheel. I do not want to say a 550-lb. wheel would not run under an 80,000-lbs. car with a proper distribution and quality of iron, but I want to make ourselves safe until such time as the wheels have been properly constructed and we get the proper iron in them to make a car safe on the road. The strength of the flange will not be so nearly strained if our heavyweight cars have center bearing or flexible side bearing trucks under them.

Mr. A. W. Gibbs, Pennsylvania R. R.—With some of our heaviest cars we have run across some great surprises in the last year or two, and some expensive tests have been made to overcome them. The wheel makers are experimenting with some radical changes in the forms of the wheels, and it would be a mistake at the present time to hamper them by prescribing a minimum weight of wheel. Many of the wheel makers are experimenting in the direction of using a high grade of material. If we hold this report off until next year we will get some information as to the direction in which we can work. I therefore ask that the recommendations of the committee be withdrawn until next year.

On motion it was voted that the committee on cast iron wheels be continued for another year to consider the whole subject of material, designs, form and weight of cast iron wheels for 60,000, 80,000 and 100,000-lbs. capacity cars.

UNIFORM SECTION OF SIDING AND FLOORING.

(*See Railroad Gazette, June 28, page 458.*)

Mr. L. T. Canfield—Did the committee, in deciding on the section of flooring, consider the tongued and grooved section?

Mr. R. P. C. Sanderson—No, sir.

Mr. Canfield—A great many people, I think, are still using that, particularly in box car service and grain-carrying cars. I think in those cases it is a better section than the ship-lap. Another thing, they quote widths from 5 to 10 in. I think it would be better if they quoted widths of 6, 8 and 10 in., and we would get down to three standards rather than have calls for five or six different widths.

Mr. J. J. Hennessey—I am inclined to believe that 10 in. would be too wide for car flooring, and I agree with Mr. Canfield that the tongue and groove is preferable in some cases to the ship-lap. If the boards are tongued and grooved, one board has a natural tendency to hold the other, whereas with the ship-lap there is no assistance of this kind.

Mr. Sanderson—In regard to the tongue and groove flooring, the object the committee had in view was to get at the commercial sizes. If the members prefer, for special reasons, to have the tongue and groove lining, they can get it in commercial sizes. After the remarks, the committee will send out with the letter ballot, if so decided, drawings showing some of the sections of lumber, commercial sizes, with both the ship-lap and the tongue and grooved section for the members to vote on.

AIR-BRAKE HOSE SPECIFICATIONS.

(*See report on page 481 of this issue.*)

Mr. J. MacBeth, New York Central & Hudson River—From the experience and knowledge I have of this subject, I think that one of the most serious things this Association has before it is the question of the air-brake. In my opinion there should be some standard fixed for the manufacture of air-brake hose.

Mr. L. T. Canfield—I ask the committee why it uses the serial number and has the name of the manufacturer on the hose? What is the necessity for the serial number?

Mr. H. F. Ball, Lake Shore & Michigan Southern—I think that is explained in one of the paragraphs of the report. The idea is you are able to identify the hose which may be rejected after the hose has been tested. If we buy 600 hose and one hose of a 200 lot fails, you identify the hose by the serial number of the lot.

Mr. R. P. C. Sanderson—The committee says that fully 80 per cent. of all hose renewed has failed through chafing or cutting of the inner tube at the end of the nipple or coupling. In looking over this same question, I found the percentage was probably higher than 80 per cent. A good deal of the trouble was due to defective work in putting the couplings in by air machinery; rough, injudicious work. They also refer in a previous place to what is called a hose cap, and say something of the kind ought to be used. I ask the committee whether anybody has had any experience with such a hose cap and proved it to be beneficial? This was a serious trouble on the road I was connected with, and I had no knowledge of any such device at that time.

Mr. Macbeth—We have had some experience with these caps, but not enough to justify a positive statement in our report. We found so many hose giving out at that place that we were fully satisfied something should be put in to strengthen the hose at that point, either in the hose, or by using a cap. I agree with Mr. Sanderson that over 80 per cent. of the hose gives out at or about the nipple; not on account of defective material, but owing to the swinging of the nipple and the knocking of it against frogs in the track, etc. It is under constant oscillation all the time. In my opinion, fully 50 per cent. of the hose would be saved if they did not hang down.

The report of the committee was ordered submitted to letter ballot for recommended practice.

CLEANING TRIPLE VALVES.

Mr. Quereau—I would make a motion that a committee be appointed by the Executive Committee, which may consist of one or three members, on Standard Methods of Cleaning Triple Valves and Additional Prices for Labor and Material not included in our present price list and to ask the Air-Brake Association to co-operate with us in this matter. They no doubt can give us valuable information and we will convey to them the idea, which is a true one, that they are of service. Carried.

THE CHEMICAL COMPOSITION OF ALL STEEL CAR AXLES.

(*See Railroad Gazette, June 28, page 459.*)

Mr. Nelson—On this report, as sent out, there are shown under Appendix A, Dimensions for Axles. The dimensions seem to be incorrect in some particulars. My suggestion is that they be left out of the report in the proceeding till corrected. The report of the committee was received.

Mr. Gibbs (Pennsylvania R. R.)—The first steel axles I know of in this country were introduced about 1861. I had occasion to test a number of those axles, and they were very soft; no attempt was made to deviate far from the quality of the iron. The axles gave bad results. They broke in detail, fractures starting on one side of the axle and generally working across. It will be noted that when a steel axle is injured it is rare to find that it snapped, it is generally a detailed fracture. We found that the fractures became so very serious that early in the nineties an investigation was made of the steel axles running at that time. We found three points: first, that the axles were very small; secondly, the material was not disposed in the best manner, the design was not correct, and third, the material was not regular; we were getting all kinds of steel, some hard and some soft. In January, 1896, we introduced a specification in which we used more material—put it where it belonged—but more particularly we governed the chemistry, and went to a very hard steel. Since that time, January, 1896, the company has bought a little over 307,000 axles, and all broken axles are sent into Altoona for examination and I have got just three. Those three axles were all made by one concern, two out of the same heat of steel, and all of them broke within a few months from the time of being put into service, and when we examined them we found there were large internal flaws which were produced in the process of hammering. The chemistry of the steel was all right, which

shows you can make bad axles of very good steel. We had half a dozen which were burnt off and the behavior of them don't seem to be any different than any other burned off axles. There is no evidence that those axles were brittle, but they have been simply chewed off by the boxes. About the time we introduced the specification we began making fatigue tests; circular specimens were pressed into flanges revolving in a horizontal position. The other end was loaded so that it produced definite fiber stresses on the material, tension on the top and compression on the bottom, and as fast as a specimen would break it would be taken out and another one put in. That thing has been running about five years now and the results so far show that the limits for fiber stress is certainly high enough. We think a fiber stress of 22,000 and 24,000 lbs. does not give, as a rule, a life as long as we are after. When we get down to 21,000 lbs. we get a life so long that the ends of the usefulness of the axle will result from wear and not from breakage, which is the point we want to get at.

There are a number of objections raised to the present specifications. One is that the carbon is so high that in cooling the journals with water, breakage will occur. We have no evidence so far that that is the case. Some objections have been made to other points in the chemistry. It is claimed that the carbon so high as this makes the axles brittle. I believe that is true in a drop test because a soft axle will be less likely to break than a hard axle.

Mr. A. L. Colby (Bethlehem Steel Co.)—I am glad to see that your committee expressed themselves so strongly in favor of not decreasing the carbon from 0.40 per cent., and I second Mr. Gibbs' remarks in reference to the many disadvantages of using low carbon steel for material which in service is subject to rapidly alternating stresses. I also think your committee's suggestion a wise one, that the location where the borings for chemical analysis shall be taken, should form a part of the specification; but I see no reason why the point selected should be 40 per cent. from the center of the axle instead of half way from the center to the outside.

In describing the three failures of steel axles on the Pennsylvania road Mr. Gibbs mentioned that in two of them there were internal flaws in the steel, and he made the remark that that showed that steel of good analysis could make poor axles. I think he should have said that piped ingots should not be used in making axles.

Mr. Gibbs stated that the chemistry suggested in their car axle specification was intended not to bar out any special method of manufacture. I think it would tend to do that, because Bessemer steel could not be made economically of 0.40 per cent. carbon and as low as 0.60 per cent. manganese. I think this matter of chemistry ought to be changed somewhat in your specification. For instance, I see no reason at all for specifying silicon. You specify that the silicon shall be .05 per cent., but I am perfectly sure that if you should analyze every axle on your road you would not find more than half of them that were below .05 per cent. silicon. An evidence of the fact that it is unnecessary to specify silicon may be taken from the Pennsylvania Railroad specifications themselves, for they specify for car axles .05 per cent. silicon, and for driving wheel axles .20 per cent. silicon. The Wabash Railroad has the same anomaly in their two specifications. A higher silicon than .05 per cent. gives a much better forging steel. Some manufacturers use more silicon and less manganese to obtain freedom from superficial blow holes; and some increase the manganese a little and lower the silicon. I think you should specify a limit in sulphur and phosphorous, but leave the manganese and silicon to the manufacturer. Then introduce a clause into your specifications stating that your steel axles shall be made by the open-hearth process. By specifying the open-hearth process you would limit the manganese and silicon, for the manufacturer will use no more of these expensive materials than necessary to insure sound steel. There are a few railroads that specify that the copper in the steel shall not be over .03 per cent. If your car axles were analyzed for copper in your railroad laboratories, it would be found that this requirement is also a dead letter for a good deal of the steel furnished east of the Alleghenies contains over .03 per cent. in copper, and there is no evidence that it is detrimental to the steel; in fact, what evidence does exist is the other way. The influence of copper in steel is a subject to which I have given a good deal of personal attention. There is one place in France where copper is intentionally added to steel to increase its strength, and such a low percentage as .03 per cent. is not prejudicial.

In fact, we ought to try in our specifications to drop out the "dead wood." Make them as simple as possible, and make the manufacturers live up to the specifications.

Mr. Nelson—In treating the specifications with a view to making changes this year, the committee felt that these specifications have been in use since 1896 and the Pennsylvania Railroad specifications are practically the same and some other railroad companies, I think, have used the M. C. B. specifications, although it has not been very generally done. As those specifications have been in use since 1896, we have had experience with these axles for only about five years and I think it would be unwise to make any radical changes in the specifications until we have had a longer experience. Everything so far has pointed to the fact that the specifications have at least no serious defect.

In connection with the specifications it is important to consider the design of the axle. The members will recall the report made at the convention of 1896 by the committee appointed to design an axle for 80,000-lbs. cars. They determined a method which would give the shape of the axle between the hubs of the wheels and by applying analysis found in that way the axles which have been successful, they determined the practical fiber stress. That fiber stress is very high considered from the standpoint of any other structure, but it has answered well in axles, and the reasons are apparent, that the axle is not over-strained, the elements going to strain the axle not all occurring at the same time.

There are several conditions made by the committee which probably ought to be either considered in this discussion or submitted to letter ballot. I would call attention principally to the increase in the amount of metal allowed in the wheel-seat in order that the wheel-seat may be turned down in refitting the wheels successfully. In the original design of the two larger axles it runs one inch. The committee has recommended an additional ⅛ in. added to the diameter of the wheel-seat in order that there may be a ¼ in. to turn. Of course, it is understood that the limiting size of the axle should not be decreased.

The recommendations of the committee were adopted.

REVISION OF RULES FOR LOADING LONG MATERIALS.

Mr. F. D. Casanave—There are some changes I would like to make in this report: On page 5, paragraph 24, "the distance between bearing pieces," and on page 6, paragraph 27, 5th line, should be read "not more than 2 ft. 4 in. from center line of car," instead of "not less."

Mr. Christopher—We have experienced trouble in handling long structural steel. I have occasionally been compelled to remove a car on account of that center support being forced through the car and the two center sills broken. The committee should have embodied a rule for loading that kind of material, by placing a large stick, say 6 x 8 in., or 8 x 8 in. across the cars to get the bearing as near as possible on all the sills.

Mr. Symons—I wish to bring a matter briefly before the convention that I think should be considered in reference to ascertaining the weights on lap lumber shipments. The transportation and traffic officials in the lumber-carrying roads in the South appealed to the Master Car Builders' Association for some definite rule whereby they can determine the actual weights of lap shipments of lumber. The principal trouble seems to come up by objections raised on the part of the consignees in the north when they receive shipments of long lumber, of there not having been allowance made in the original bill of lading for the weight of stakes, bearing pieces, braces, etc., and there also being quite a difference on the weight on the cars on receipt and when piled, on account of the lumber having become seasoned.

Mr. R. D. Smith—On the first page of this report I notice a recommendation that two separate committees be appointed, the one consider the formulated rules for loading long material and the other for the further consideration of safety chains. On page 6 of the report in section 27 there is a recommendation that permanent safety chains, made of iron not less than 1⅛ in. in diam., must be fastened through the end sill of these flat or gondola cars, and further down in that same section it recommends that cars not so equipped with permanent safety chains may be so equipped by the receiving road and the cost charged to the car owner. That is quite an important matter.

On page 8, in section 32, there is a matter that I want to call attention to, and that is that the tops of the sticks must be held together by two boards or wire. I lately saw an accident in a yard in Chicago. A car loaded very high with lumber that was fastened together at the top with two light boards nailed. In going around a curve the lumber shifted a little bit and the load fell off on one side and killed two trackmen who were working on the track alongside of the car.

The report of the committee, with the exception of paragraph 27, was ordered to be submitted to letter ballot.

Mr. Symons—I move that the committee on this subject for the ensuing year provide for loading long material in box and closed cars and that the committee also be authorized to take up the provision of some definite rule whereby they can determine the actual weights of lap shipments of lumber.

Mr. Rhodes—In seconding Mr. Symons' motion, I wish to call attention of the convention to a serious matter. One of the materials which is loaded in cars which is damaging box cars very much is railroad ties. Ties are put in very carelessly; they are loaded by contract and we all have experienced the ways in which the ends of the box cars get knocked out. If our inspectors would see that the ties are loaded evenly through the length of our box cars and that they are well up to the end and cross ties put in so that the ties won't shift, that a very great deal of improvement can be made and our house cars saved from damage.

Mr. Stark—I would like to call attention to the shipment of sheet steel. In the iron districts where sheet steel composes quite a large proportion of the output it has a very destructive effect on the ends of the cars and I believe the committee should consider that. There should be some provision made to prevent the steel plates from cutting off the end posts and sheathing.

Mr. Whyte—I ask for information as to loading long girders. The committee recommend two bolsters for each girder. Now if two cars are required, the bolster may be loaded while the cars are on a tangent track, and when the cars come to a curve the girder takes the chord of the arc.

What provision is made for the movement of the girder lengthwise of the cars on entering the curves and on leaving the curves.

Mr. Casanave—On page 20 one girder rests on a bolster which is directly over a slot in the car two inches long, providing for a 2-in. movement. That is sufficient for all ordinary curves on the main line. If there are curves with shorter radii in the yards the girders will have to be loosened until they have past around those curves and when they are shipped on the main line those girders will have to be fastened down, in which case a 2-in. motion is sufficient.

Mr. Hennessey—The most important point brought out in this discussion is one brought out by Mr. Rhodes; that is the enormous damage that is done to box and stock cars in loading ties and short lumber. Some roads have adopted a plan in loading ties or short lumber they place a piece of timber close to the end of the car about 6 in. thick and then load the ties on an incline, so that they must move upwards instead of sliding straight out.

Mr. Symons—I move that the committee to be appointed by the executive committee be instructed to co-operate with the transportation officials as to the loading of lumber on cars in the lumber carrying districts, with a view to arriving at some definite methods of determining the weights of lap lumber shipments, and also that this committee co-operate with the American Railway Association. Carried.

INDEXING THE PROCEEDINGS.

Secretary Taylor—We have received a communication from Mr. George L. Fowler, to the effect that he will prepare an index which shall be as complete in every particular as the work done for the Master Mechanics' Association, from the first volume of our proceedings to and including the issue of 1900, for the sum of $625. The indexing of the decisions of the arbitration committee is not included in this price, but if an index is to be made of those decisions, with a digest of the same, referring to the rules under which they were passed, and quoting the date on which the rule was rescinded, if that has been done, there will be an additional charge of $100.

The present estimated cost of the work is $725, for the collating of the matter, to which $800 should be added for printing, binding, etc., or a total of $1,500. The Executive Committee recommends that the index be made, including an index to the decisions of the Arbitration Committee.

Mr. Rhodes—I move that the recommendations of the Executive Committee be adopted. Carried.

DRAFT GEAR.

(*See Railroad Gazette, June 28, page 468.*)

Mr. Bronner—The report of the committee on Draft Gear is merely a report of progress on the part of the committee. On account of the illness of the gentleman elected to act as engineer for the committee, we have been delayed in making any tests or coming to any conclusions. We make this report of progress, and if the association sees fit to continue the committee in the work, we would like to have two members added to the committee, and would especially call upon you gentlemen here who are interested in the subject, to discuss the question of tests to be made by the committee, which we propose to make this summer if the work is continued.

Mr. Sanderson—A considerable number of tests of draft gears were made on the road with which I was connected, and we gained a good deal of experience in those tests. The test consisted of drop tests and service tests. While the apparatus used in these drop tests was crude and perhaps not very reliable, at the same time it was evident in watching these tests that a great deal of useful information could be obtained from the results of such tests, that the structure of the draft gears could be judged as to their relative strength. I believe that the committee in making their tests should design and build a drop test, especially suited for testing draft gear. The drop test should be entirely by the jerk. I think the apparatus should be so arranged that the test can be made with one draft gear instead of two, if advisable, so as to be more certain of results, and that the draft gear should be under strain at the times it received the shock, to more nearly bring it under service conditions. But even after such drop tests have been made, road tests, in my judgment, are going to be absolutely necessary to satisfy the managing officers of the railroads. It will take a good deal of money and a great deal of time to make these tests. I do not believe the committee can make a report in one year, or three years, that will be at all final, for the reason that after the first tests have been made on the draft gear each manufacturer will want to remedy his defects, which he should have a right to do in order to bring his apparatus to the highest point of excellence. While we are in the thing, we should work the matter to a finish.

Mr. Hennessey—I believe the railroads of this country can hardly afford to put off a report of this committee for several years. I do not think there is anything to-day in car construction which demands more immediate action than the strengthening of our draft gears. I certainly would like to see this committee make positive recommendations a year hence.

I believe further that the draft gear they should work on should not receive the shocks much below the center line. There should be no bell-crank movement in what they present.

Mr. Sanderson—The strengthening of the draft gear is one thing, but there is no sense in strengthening it beyond the strength of the center sills. We ought to have a center column in the car to which your draft

gear should be attached to take the longitudinal shocks. Another point is that the dead block is an absolute necessity with the M. C. B. coupler. I think we would be wasting money if we tried to make a draft gear strong enough to stand all collisions and shocks. If we make the center sills strong enough to hold our heavy center column sill construction, it will, if the draft gear is sufficiently cushioned below, stand a shock when it is delivered through the dead blocks from end to end without destructive effect within reasonable limits. It was for that reason I said that the test under the drop should be done by jerking tests as the draft gear always acts equally in both directions. What will be the strongest in the jerk tests will be sufficiently strong to properly cushion the blow in a collision, for example, up to the limits of the center sill strength.

In regard to the bell-crank action referred to by Mr. Hennessey, I agree with him. The center sill of the old cars built with floor joists are being broke off in front of the bolster. That is due to collision and buffer shocks, and a large proportion of the heavy repairs we come across is due to that. I think it is a waste of time and money to go ahead and put up an expensive laboratory to test draft gears and continue that form of construction.

Mr. Quereau—It occurs to me that a form of continuous draft gear, which is not the one now in use may be worth while discussing. It makes each sill of the car a draft sill for all pulls. I do not know that any existing continuous draft rigging will do that. I know of a continuous draft rigging having a single draft rod running through the length of the car which has the advantage of making each sill of the car a draft sill, and also has the advantage mentioned by Mr. Sanderson, of having a centerpost to absorb the shocks above it. The draft rod is placed between the draft sills at the center line of the draft sills, and filling blocks make solid the space between the draft sills, except that necessary for the passage of the rod.

I have heard the statement made on good authority that 75 per cent. of all freight car repairs are due to the draft rigging. I can safely say, with the continuous draft design which I have in mind, that that proportion can easily be reversed, that not 25 per cent. of the repair to cars will be due to the draft rigging. I also want to emphasize the importance of having the buffing block; malleable iron buffing blocks in connection with well-designed continuous draft rigging will do away with a large proportion of our troubles.

Mr. F. H. Clark—I do not know that any of the tests proposed will fully meet the requirements. The drop test, in some respects, is lacking and it should be supplemented by the service tests. The trouble with the service tests is that it takes too long to get any results. Another way of making the tests has occurred to me. The committee having in charge the brake tests made use of a device called a slidometer, which, I understand, gave satisfactory results. The same principal might be applied in making tests of draft rigging.

As to the bell-crank action and the suggestion regarding draft attachments to the sill: The Burlington began ten years ago to build furniture, box, stock and coal cars, dropping the sills, cutting through the end sill, or making a notch in the end sill, in order to get the line of draft 3 in. below the bottom of the longitudinal sills. That construction gave very good satisfaction, but it had certain disadvantages, among which was the fact that it was more or less difficult to inspect the trucks and wheels. We have recently been building cars with the center line of draft on the level with the lower side of the center sills. With this construction we avoid the necessity of cutting through the end sill, as we simply turn the end sill the other way and make the necessary attachments between the longitudinal sills and end sills, by means of sill pockets or some similar construction, and also by means of the draft attachments shown. We have something like 1,500 cars in service, part of them having the Dayton rigging and part the Miner rigging.

Mr. Roberts—As a member of the committee I would say that I do not understand that this committee is appointed for the purpose of designing a draft gear for cars to be built in the future. We have to meet conditions as they exist now. Probably 90 per cent. of the freight cars which are in service at the present time will be in service for the next five years. Perhaps 95 per cent. of them are underhung. We have established standard heights for drawbars, standard diameter of wheels, and how are we going to raise the center line of the draft rigging under these conditions?

The statement made by Mr. Quereau that 75 per cent. of the repairs made to freight cars is due to defective draft rigging is not the experience of the road with which I am connected. I believe that the ratio or percentage of money expended which can properly be charged against draft rigging is overestimated.

Mr. Appleyard—I suggest that in order to maintain our present standard height of drawbar and diameter of wheels, etc., it may be necessary to deepen the center sills. We are designing some new cabooses on these lines, putting in steel center bars of a depth which will answer for the draft timbers as well, that is to say, getting the draft rigging up between the center sill.

Mr. Sanderson—I think there is a very common misunderstanding with regard to continuous draft gear. It is a wrought-iron chain, reaching from end to end of the train, and each link of that chain pushing the car in front of it by its spring. The idea of pushing the car in front by the spring is fascinating; but the whole train has to be considered, and the rods, unless they have the action of the spring at each connection, form a rigid iron chain, link by link, running the whole length of the train. In handling the trains it is impossible to avoid jerks, and that rigid chain will snap and break. The continuous draft gear is all right so far as an individual car is concerned, but wrong as far as the whole train is concerned.

Mr. Canfield—I see a number of objections to raising the drawbar any higher. It would be necessary to lower the floors and perhaps make it difficult for us to load our cars at the platforms and we are not able to get a decent end sill on that kind of construction. It also causes, if we use buffer blocks, to get them out of line with those now in service, as we would have to drop the buffer block on the end sill. If we raise it higher we get no service. Another thing that occurs to me is that it makes it hard to protect the angle valve of the air pipe in that kind of construction. We are destroying many hose to-day on account of their coming in contact with something on the other car and we must keep them further back. Then we have to arrange for some substantial striking point for the horn of the coupler. We cannot do that very well with the kind of end sill we are forced to put in by placing the drawbar between the draft sills. We should have a form of construction whereby the draft timbers can be secured to the center sills and get better results than if they were put up higher. The drafts should extend through the transom, and go back behind the transom, so that the timbers, to which the drawbar is secured, will carry part of the load of the car and also act as a support for the sill. I think we can do something with the construction now in service by having a design of draft rigging to be attached to the under side of the car.

Mr. Stark—We are to-day constructing cars with the underhung draft rigging attachment and are getting good results. I believe with a composite car we get better results from the underhung attachment than from attaching to the center sills. We extend draft timbers running through an open bolster 8 or 9 in. deep, and we can break the coupler head off, and break the car in two in the middle, without damaging the draft timbers at all. We have had cars constructed in that way for six years and find that to be a fact.

I do not believe the Topeka tests were fair. I understand they were tested without springs and that is not a fair test. Our springs should be longer. To undertake to stop a loaded car of 148,000 lbs. with only a 1¾-in. compression is hardly the thing. I believe we should have more than that.

Mr. Symons—I am convinced that a large percentage of repairs to draft gear is occasioned by rough handling of our cars. The transportation officers should take that matter up and see that the cars are handled with more consideration.

Mr. Brazier—Years ago we would find along the tracks broken drawbars; to-day we find ends of the cars pulled out. Something like 3,000 couplers were taken out of service on account of defects, and 1,500 knuckles removed, on our system in one year, caused by rough usage in the yard. If we can educate the transportation department to use discretion in handling cars it will save us trouble. We should also aim to give more attention to the spring draft material. We are using on the New York Central many cars, in which, when we took out the timbers, we put in metal draft rigging which ties the car from end to end and gives good satisfaction, using twin springs.

Mr. Symington—My experience has been that by far the greatest trouble is in broken draft timber bolts. They put the keys in under the car pretty tight, and the timber in shrinking away from the keys, prevents the keys from performing the function for which they were intended. The bolts are tight in the sills and in the draft timbers and before the key in ordinary construction can do its duty, the bolt must be bent. That can be obviated by making the hole in the sill slightly oblong and by simply using the bolts to hold the draft timbers up to the sills. By doing that we throw the sheering strain on the key and I have never seen one of these keys broken.

Mr. Sanderson—It has been stated that the size of the locomotives was being increased, and that we are also operating them as double headers and triple headers; but the damage to the draft gear is not due entirely by any means to the pull of the engines. It is the train shock. The shock, where it is an impact blow or jerk, is directly in proportion to the load in the car. That is to say, if a car with 100,000 lbs. capacity was loaded and moving at a certain speed per hour and is suddenly stopped, it strikes a heavier blow than a car of 40,000 lbs. capacity. It is very necessary to have a strong draft gear for heavier cars than for light cars.

Mr. Leeds—I suggest that the members try the draft rigging which has already been adopted by this Association. It is a most decided improvement over the majority of draft riggings which come on our road. If all the members would adopt the standard draft rigging as recommended by this Association a good many years ago, they would reduce the expense of repairs to the rigging to a great extent. Most of our repairs to draft rigging is on foreign cars, especially those where the tail-bolt is used and they take a 1¾-in. bolt and punch a hole from $^{7}/_{16}$ to $^{9}/_{16}$ in it and remove the metal to such an extent that any bridge builder who would put up a bridge with such a construction would be criminally liable.

Mr. Hennessey—I move a reconsideration of the motion passed at the first session to the effect that "cotter pins shall not be considered a necessary safety device in connection with knuckle pins." Carried.

Mr. Hennessey—I move that the absence of the cotter pin is not detrimental to the M. C. B. coupler. Carried.

On motion of Mr. Canfield the Secretary was instructed to apply to the Interstate Commerce Commission for enough copies of the printed rules issued by the Commission to their car inspectors, to distribute among the various railroads; and that the Secretary request permission to publish a copy of the rules in the *Proceedings* of this convention.

Topical Discussion—Efficient Waste for Packing.

Mr. F. A. Delano (written discussion)—Railroad men in general are divided in their advocacy of either wool waste and cotton waste. Considering the words of each, we find that wool is more elastic and probably more durable, being a stronger and more wiry fiber. It is more expensive, but being more elastic and durable, one pound of it will go further than a pound of cotton waste.

Cotton waste, besides being cheaper, has greater absorptive power; in other words, it will saturate one-quarter to one-third more oil than wool waste. It has also somewhat greater capillary action, that is, it will raise oil higher than wool waste. Waste is sold at all sorts of prices and of varying quality. My attention was recently called to a case of a shipment of waste sold for wool waste which analyzed by the railroad company's chemist as follows:

Moisture, oil, dirt, etc.	16.6 per cent.
Wool	6.5 per cent.
Cotton	76.9 per cent.
	100 per cent.

The manufacturers at once acknowledged that the shipment was made in error and furnished another lot which analyzed:

Moisture, oil, dirt, etc.	15 per cent.
Wool	44 per cent.
Cotton	41 per cent.
	100 per cent.

On further protests the manufacturers said that not one railroad in fifty got all-wool waste, even when they specified it and that all-wool waste would cost 16 cents a pound. They submitted three samples which they offered at 12, 11 and 10 cents respectively. An analysis showed that the samples consisted:

	12c. Wool Waste.	11c. Wool Waste.	10c. Wool Waste.
Moisture, oil, dirt, etc.	13.2	13.7	12.1
Wool	86.8	86.3	86.7
Cotton	—	—	1.2
Total	100.0	100.0	100.0

Analyses of other manufacturers' waste shows that high grade wool waste of commerce frequently contains 13 to 15 per cent. of moisture, oil, dirt, etc., 60 to 80 per cent. of wool, and 5 to 25 per cent. of cotton.

In the same way there is much difference in cotton waste, from the poorest grades containing much short shoddy fiber, bobbins and other foreign matter, to the best white cotton waste of long fiber free from dirt and refuse. The cost varies all the way from less than 2 cents to more than 6 cents per pound.

Topical Discussion—Release Rigging for Couplers.

Mr. Crawford—This subject was suggested for discussion on account of the fact that our attention has been called to the large number of defective parts of the uncoupling arrangements, by the inspectors of the Interstate Commerce Commission.

While the uncoupling arrangements recommended by the Association in 1897 (which is closely followed by us), has been fairly satisfactory, the number of parts damaged in service has materially increased during the past two years, probably due to the changed conditions, faster shifting, etc.

We now have at important points twelve men whose entire time is devoted to keeping up the uncoupling arrangements, which is in addition to the attention given them by our regular inspectors at other points.

From the investigation made so far we find the relative proportion of failures of the different parts is as follows: Release rod missing and bent, 55 per cent.; clevis pins missing, 20 per cent.; clevises, clips, links, etc., 25 per cent.

This covers cases only when actual renewal was necessary. Many cases of bent release rods, etc., are not reported, as they are straightened with hammer or pipe without removal.

In the past the inspectors of the Interstate Commerce Commission have considered the absence of the cotter from the knuckle-pin as a defect. As we do not so consider it, the number is not included above.

From the information we have, it would seem that the defects mentioned are generally due to the following causes:

First—Load shifting on adjacent cars.

Second—Cars cornering.

Third—Poling.

As the causes given above cannot be removed entirely, and if the experience of the other roads has been similar, it would seem that the subject of relocation or redesign of the release rigging is worthy of consideration by the association.

	Number.	Per cent.	Per cent.
Release rod gone	234	5.6	54
Release rods renewed	1403	33.2	—
*Cotter pins	1167	27.7	—
Clevis pins gone	575	13.6	19
Clevises gone	330	7.8	11
Angle clips gone	212	5.0	7
Links gone	109	4.5	6
Locks gone	4219	2.6	4
*Omitted	3052	100.	100

Kind of Cars.—Box, plain, gondola, stock, self-clearing gondola.

Probable Causes.—1, Load shifting on adjacent cars; 2, cornering; 3, poling; 4, couplers pulling out too far by slack, smashed, inbroken, etc.; 5, dead blocks on very short curves and in helping up grades.

Remedy (?)—Locate rod back against end of car, provide with malleable iron lift arm, also operating arm, or place under end sill, abandon cotter pins in knuckle pins.

Ideal—1, Always operate and have great range; 2, have the non-automatic lock set feature, so it can be used when desired; 3, operative from either side.

Topical Discussion—Tonnage Rating for Representation in the Association.

Mr. Lentz—The present system of representation on the basis of 8-wheel cars owned or controlled, was adopted and made part of the constitution of this association at an ad-

journed meeting held at Niagara Falls, October 10th and 11th, 1882. At that time there were few, if any cars, above 40,000 pounds capacity and the capacity of the cars owned or controlled by the railroads of the country were so nearly uniform that the basis of representation as then agreed to was as nearly equitable as it could be made.

The conditions to-day are very different and in my judgment it is time that our constitution be so amended as to provide for representation based on the carrying capacity of cars owned or controlled, it being only justice that the roads who are leaders in the movement of providing larger capacity cars for the economical handling of the traffic of the country should have more weight in deciding questions vitally affecting their finances than roads who do not contribute to the furnishing of this improved equipment.

Many roads are abandoning heavy repair cars of less than 60,000 pounds capacity on account of the greater economy in the use of larger cars, and as new cars are required, cars of 80,000 and 100,000 pounds capacity are substituted.

On the present basis of representation a road owning 1,000 cars of 40,000 pounds capacity has the same voting power in the association as a road owning 1,000 cars of 80,000 pounds capacity. This is certainly not just or equitable.

In my opinion, the roads investing their capital in new and improved equipment for the benefit of all the roads over which this equipment may run should be recognized by the association by an increase in voting power.

It seems to me that passenger equipment cars, maintenance of way cars and cabooses should not be included in the list of cars on which the representative vote is based, and that only equipment used for carrying revenue freight should be considered.

The proposed representation could be based on a vote for each thousand pounds of nominal capacity, each ton, or, as the average capacity of all the cars in the country is near 60,000 pounds, a vote for each 60,000 pounds nominal capacity. If the latter plan should be decided on, it would mean two-thirds of a vote for a 40,000 pounds capacity car, five-sixths of a vote for a 50,000 pounds capacity car, one vote for a 60,000 pounds capacity car, one and one-sixth of a vote for a 70,000 pounds capacity car, one and one-third vote for an 80,000 pounds capacity car, and one and two-thirds vote for a 100,000 pounds capacity car.

This arrangement would, of course, decrease the number of representative votes of roads owning cars of less than 60,000 pounds capacity and not owning any cars of greater capacity, but as new cars of large capacity are added to their equipment the representative vote would increase in proportion. As an illustration: The road which I represent at present owns 36,095 eight-wheel cars, of which 6,418 are 40,000 pounds; 1,031 50,000 pounds; 24,003, 60,000 pounds; 1,960, 80,000 pounds; 1,050, 100,000 pounds; 4, 110,000 pounds capacity, and 1,629 miscellaneous.

Under our present basis of representation, I am entitled to 36 votes for cars and one individual vote; under the proposed basis I would be entitled to 34 votes for cars and one individual vote.

It would seem to me that for the reasons given it would be just as wise to determine this question in the affirmative and our constitution amended accordingly.

Mr. Rhodes—This seems to be a pertinent subject, in view of the rapidly increasing size of our cars, and I would move that this subject be referred to the Executive Committee for its consideration, to determine whether in their opinion the matter is worthy of being delegated to a committee to report at the next annual meeting.

Motion carried.

Topical Discussion.

Mr. Todd—Mr. Crawford wished me to present his reply to this topic. He did not wish to say anything in regard to turning the journals at this time. The rolling of journals has proved very advantageous, particularly in reducing material, and in fact almost entirely eliminating the trouble with hot boxes under new cars which are built at our own shops. In addition it has very materially reduced the number of hot journals under new cars built at outside car manufacturing shops. In fact, with cars built at our own shops and in several cases with cars built at outside shops, where the journals have been rolled, we have had no trouble in loading the cars at once to their marked capacity, plus the usual ten per cent.

The advantages thus derived are so great that it would seem that if other roads have derived similar advantages, it might be well to have the rolled journals adopted as standard recommended practice, so that individual companies, as well as smaller railroad companies, having their cars built at outside shops, would insist on having the journals under their cars rolled, thus obviating the troubles from hot journals and loading under the capacity which has been found in the past.

Mr. Brazier—We do not use rolled journals. We put all our journals in high speed lathes and polish them with emery.

Mr. Canfield—We do not think it is good practice to use the roller. The object of using it is to smooth the journal and roll down any particles of the iron or steel that may be standing up. It does that and would be all right if the journal always continued rolling in the same direction. But the minute you reverse the motion of the car and start it to roll the other way, these particles are liable to cut in the brass and give you worse trouble.

Mr. Hennessey—We have had some experience in the use of rollers. We have built our equipment with the exception of 500 cars, and for the last 10 years rolled all the journals without any additional cost to the company. While doing the wheel fit we rolled the journal at the same time. We have had a large number of cars taken from the works and loaded them at once to half their capacity. We sometimes take the cars to the coal yards and load them to their full capacity. In something over 20,000 cars rolled, we have never had one cut journal and the number of journals removed has not been worth considering.

OFFICERS.

The following officers were elected: President, J. J. Hennessey, Chicago, Milwaukee & St. Paul; First Vice-President, J. W. Marden, Boston & Maine; Second Vice-President, F. W. Brazier, New York Central & H. R. R. R.; Third Vice-President, W. T. Appleyard, New York, New Haven & Hartford; members of the Executive Committee: George W. Demarest, Pennsylvania Lines West of Pittsburgh; William Renshaw, Illinois Central; J. T. Chamberlain, Boston & Maine; Treasurer, John Kirby, Lake Shore & Michigan Southern.

Mr. Brazier—There is one important committee that has worked harder than all the rest this year. You know what an able report the Committee on Arbitration has presented. I move that a vote of thanks be extended to the Arbitration Committee for the work they have done in the past year and for the very able decisions they have rendered. Carried.

Master Car Builders' Reports.

(Concluded from last week.)

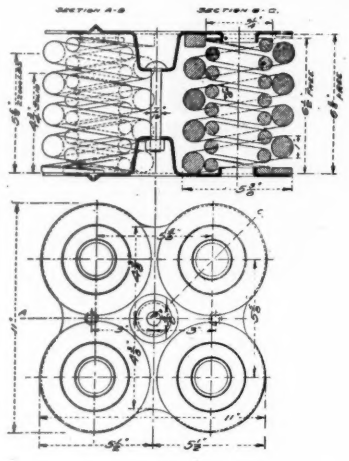
REVISION OF RECOMMENDED PRACTICE FOR SPRINGS.

After having carefully gone over the specifications of the present recommended practice, it was found that it would be necessary to make a complete revision of the springs. The trouble with the present recommended practice for springs has been due principally to a lack of sufficient material and to specifying loads to be carried beyond the endurance of any known spring steel. Before deciding upon the springs as now submitted, the various spring specifications which were received in reply to the circular of inquiry were carefully gone over so as to ascertain if any of these springs fulfil all the requirements, and while some of the springs are very close to what would be desired, only a few were found to be correct, and these have been included in the revision. The majority, however, were found to be short in material, and consequently to have stresses too high for good practice, and these designs could not be recommended for adoption. In the preparation of the new springs the following conditions may be noted:

First. Each complete cluster of springs has been considered as a unit, regardless of the number of individual coils contained in each cluster; this method of classifying the springs it is thought will cause less confusion than to classify every separate coil as in the present recommendation.

Second. Wherever possible the springs for the lighter cars are constructed of bars similar to those used for the heaviest cars by removing some or all of the interior coils; thus, for instance, spring "B" for 70,000-lb. cars with arch bar trucks consists of four coils similar to the outside coils of spring "D," and spring "C" consists of four outside coils and of two inner coils of the same dimensions as for class "D." While this arrangement of springs does not give the exact height with loaded cars as would be the case if each class of spring was especially designed for the class of cars for which it is intended, the difference is so slight that it has no practical influence.

Third. The stress in the steel has been calculated to



Eight bars: Four bars 1 *in diam.,* 65¼ *in. long, tapered to* 72¼ *in. Four bars* ⅞ *in. diam.,* 62½ *in. long, tapered to* 66¾ *in.*

Normal weight of each first four bars, 14 *lbs.* 12 *oz.; minimum weight* 14 *lbs.* 5 *oz.*

Normal weight of each second four bars, 5 *lbs.* 6 *oz.; minimum weight,* 5 *lbs.* 3 *oz.*

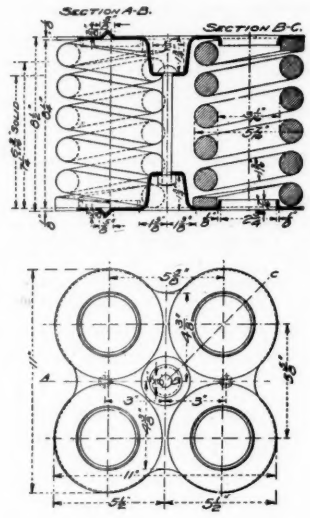
Outside diam. first four coils, 5⅝ *in.; second four coils,* 3¼ *in.*

Heights first four coils, 6⅝ *in. free,* 4¾ *in. solid,* 5⅝ *in.* 3,970 *lbs.; capacity,* 7,440 *lbs.*

Heights second four coils 6½ *in. free,* 4¾ *in. solid,* 5⅝ *in.* 1,530 *lbs.; capacity,* 3,060 *lbs.*

Cluster of springs: Heights exclusive of caps, 6⅝ *in. free;* 4¾ *in. solid;* 5⅝ *in.* 22,000 *lbs.; capacity,* 42,000 *lbs.*

Spring A—60,000-lbs. Cars, Arch Bar Trucks.



Four bars, 1⅞ *in. diam.,* 73¾ *in. long, tapered to* 80⅜ *in.*

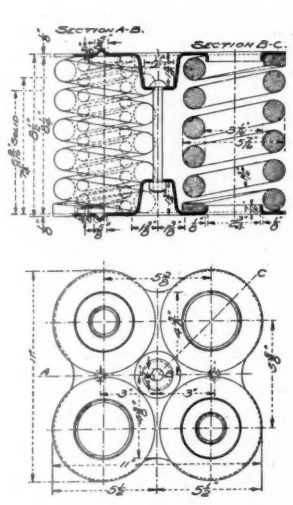
Normal weight of each bar, 23 *lbs.; minimum weight,* 22 *lbs.* 5 *oz.*

Outside diam., 5⅞ *in.*

Heights, 8¼ *in. free,* 6⅛ *in. solid,* 7¼ *in.* 7,400 *lbs.; capacity,* 12,500 *lbs.*

Cluster of springs: Heights, 8¼ *in. free,* 6⅝ *in. solid,* 7¼ *in.* 29,000 *lbs.; capacity,* 50,000 *lbs.*

Spring B—70,000-lbs. Cars, Arch Bar Trucks.



Six bars: Four bars 1⅞ *in. diam.,* 73¾ *in. long, tapered to* 80⅜ *in. Two bars,* ⅞ *in. diam.,* 74¼ *in. long, tapered to* 77¾ *in.*

Normal weight of each first four bars, 23 *lbs.; minimum weight,* 22 *lbs.* 5 *oz.*

Normal weight of each second two bars, 6 *lbs.,* 7 *oz. minimum weight,* 6 *lbs.* 4 *oz.*

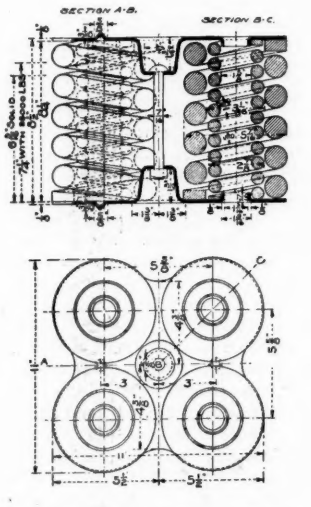
Outside diam. of first four coils, 5⅞ *in.; second two coils,* 2⅞ *in.*

Heights: First four coils, 8¼ *in. free,* 6⅝ *in. solid,* 7¼ *in.* 7,400 *lbs.; capacity,* 12,500 *lbs.*

Heights: Second two coils, 8¼ *in. free,* 6⅝ *in. solid,* 7¼ *in.* 2,100 *lbs.; capacity,* 3,500 *lbs.*

Cluster of six springs: Heights without caps, 8¼ *in. free,* 6⅝ *in. solid,* 7¼ *in.* 33,800 *lbs.; capacity,* 57,000 *lbs.*

Spring C—80,000-lbs. Cars, Arch Bar Trucks.



Eight bars: Four bars 1⅞ *in. diam.,* 73¾ *in. long, tapered to* 80⅜ *in. Four bars,* ⅞ *in. diam.,* 74¼ *in. long, tapered to* 77¾ *in.*

Normal weight of each first four bars, 23 *lbs.; minimum weight* 22 *lbs.* 5 *oz.*

Normal weight of each second four bars, 6 *lbs.* 7 *oz.; minimum weight,* 6 *lbs.* 4 *oz.*

Outside diam. of first four coils, 5⅞ *in.; second four,* 2⅞ *in.*

Height first four coils, 8¼ *in. free,* 6⅝ *in. solid,* 7¼ *in.* 7,400 *lbs.; capacity,* 12,500 *lbs.*

Height second four coils, 8¼ *in. free,* 6⅝ *in. solid,* 7¼ *in.* 2,100 *lbs.; capacity* 3,500 *lbs.*

Cluster of springs: Heights without caps, 8¼ *in. free,* 6⅝ *in. solid,* 7¼ *in.* 38,000 *lbs.; capacity,* 64,000 *lbs.*

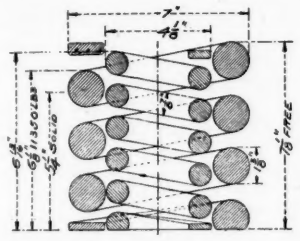
Spring D—100,000-lbs. Cars, Arch Bar Trucks.

be as nearly uniform in all the bars when solid as practical dimensions will permit, and has been confined within the limits of 80,000 and 85,000 lbs. per sq. in.. except in the springs for 100,000-lb. pedestal trucks, in which the limit has been exceeded on account of the impossibility of designing a satisfactory spring with a lower stress in the available space.

Fourth. In order to obtain the required capacities in double coil springs, it has been necessary to make the inner coils in some of the springs of heavier steel than would be consistent with the diameter of these coils when compared with the outer coils. The increase in stress in material which would naturally result from such construction has been overcome by reducing the free height of the inner coils to dimensions corresponding to the large bars used, so that the stress in both coils, when solid at the same height, will be practically the same.

Fifth. No particular specifications have been prepared for springs for cars of 40,000 and 50,000 lbs. capacity using arch bar trucks, but springs for these cars may be made up from bars used in the construction of spring "A" for 60,000-lb. cars by removing two or all of the inner coils.

Springs A, E, F and G, as recommended, do not conform exactly to any springs now in service as far as known, but they are of such dimensions that they can be used in place of similar springs now in service. Of springs B, C and D there are about 200,000 in service, and from reports received they have met all requirements,



Two bars: First bar, 1⅜ in. diam., 67½ in. long, tapered to 76⅜ in. Second bar, ⅞ in. diam., 61¼ in. long, tapered to 66⅜ in.

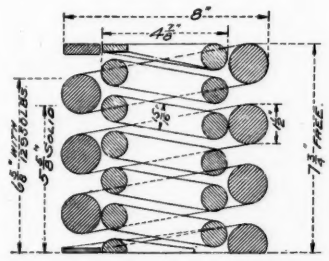
Normal weight: First bar, 28 lbs. 8 oz.; minimum weight, 27 lbs. 10 oz. Second bar, 10 lbs. 8 oz.; minimum weight, 10 lbs. 2 oz.

Outside diam.: First coil, 7 in.; second coil 4⅛ in.

Heights: First coil, 7⅛ in. free, 5¼ in. solid, 6⅛ in. 8,270 lbs.; capacity, 15,530 lbs. Second coil, 6⅛ in. free, 5¼ in. solid, 6⅛ in. 3,080 lbs.; capacity, 7,000 lbs.

Cluster of springs: Heights, 7⅛ in. free, 5¼ in. solid, 6⅛ in. 11,350 lbs.; capacity 22,530 lbs.

Spring E—60,000-lbs. Cars, Pedestal Trucks.



Two bars: First bar, 1½ in. diam., 76½ in. long, tapered to 86¾ in. Second bar, 1⅜ in. diam., 74 in. long, tapered to 80 in.

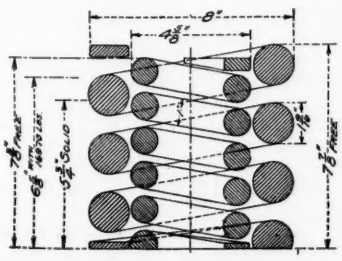
Normal weight: First bar, 38 lbs. 6 oz.; minimum weight, 37 lbs. 4 oz. Second bar, 14 lbs. 6 oz. minimum weight, 13 lbs. 15 oz.

Outside diam.: First coil, 8 in.; second coil, 4⅞ in.

Heights: First coil, 7¾ in. free, 5⅝ in. solid, 6⅝ in. 9,200 lbs.; capacity 19,400 lbs. Second coil, 7¾ in. free, 5⅝ in. solid, 6⅝ in. 3,780 lbs.; capacity, 7,100 lbs.

Cluster of springs: Heights, 8 in. free, 5⅝ in. solid, 6⅝ in. 12,950 lbs.; capacity, 26,500 lbs.

Spring F—80,000-lbs. Cars, Pedestal Trucks.



Two bars: First bar, 1⅝ in. diam., 74⅜ in. long, tapered to 84½ in. Second bar 1 in. diam., 65½ in. long, tapered to 71¼ in.

Normal weight: First bar, 40 lbs. 5 oz.; minimum weight, 39 lbs. 1½ oz. Second bar, 14 lbs. 8 oz.; minimum weight, 14 lbs. 1 oz.

Outside diam.: First coil, 8 in.; second coil, 4⅝ in.

Heights: First coil, 7⅞ in. free, 5¾ in. solid, 6⅝ in. 11,940 lbs.; capacity 20,300 lbs. Second coil, 7½ in. free, 5¾ in. solid, 6⅝ in. 5,030 lbs.; capacity, 10,060 lbs.

Cluster of springs: Heights, 7⅞ in. free, 5¾ in. solid, 6¾ in 16,970 lbs.; capacity, 30,360 lbs.

Spring G—100,000-lbs. Cars, Pedestal Trucks.

and as they are correctly designed, there is no reason why failures should be anticipated. It is believed that all of these springs will fully meet the requirements of a majority of the railroads, as well as of the manufacturers of springs, and while there may be certain constructions of trucks for which they will not be suitable, the number of such trucks is not large and they will gradually disappear.

A set of drawings with full details and specifications of the revised springs, and springs for 100,000-lb. cars with details of spring caps for springs used with arch bar trucks is attached.

This report is signed by Charles Lindstrom, Chairman; A. G. Steinbrenner, and R. P. C. Sanderson.

AIR-BRAKE HOSE SPECIFICATIONS.

In comparing the specifications received from members representing 253,381 cars, in reply to a circular of inquiry the committee finds that the character of the rubber and cotton fabric specified are practically alike and the quality of the gum in the inner tube is uniformly the same. The limiting dimensions of length and diameters are alike in all cases, with the exception that two roads specify that the ends of the hose shall be enlarged to receive the fittings, while all of the other roads specify that the inside diameter shall be uniform from end to end. The requirements in regard to markings for the hose are similar in all specifications, with the exception that two of them show the size of hose and one a serial lot number in addition to the regular marking. The committee believes that the use of a serial lot number is desirable for the reason that it facilitates the identification of accepted or rejected lots of hose by the testing department and others who have to do with the handling of hose prior to its being put into service. It also affords a ready means of referring to records of tests when hose are finally removed from service. One requires that each hose shall be subjected to a proof pressure test of 250 lbs. and two require a proof pressure test of 300 lbs., while the remainder do not have any requirements of this nature. It is the opinion of the committee that this is an essential requirement, and believe it should remain in the specifications.

In connection with the friction test one specifies the use of a 20-lb. weight to be suspended from a separated end of the section of hose to be tested, and specifies that the average speed when unwinding must not exceed 8 in. in 10 minutes; all of the others specify 25 lbs. for the suspended weight and average unwinding speed 6 in. in ten minutes. For the stretching test one road specifies that the rubber in the lining of tube, cover and friction shall be stretched until the 2-in. marks are stretched 8 in. apart, and that a permanent set shall not be more than ½ in.; all of the other roads specify that rubber shall be stretched to a distance of 10 in. from the 2-in. marks. Six of the roads specify inner tubing only shall be given the stretching test, while two of the roads require that the rubber in the inner tube, friction and outer cover be subjected to the stretching test. It will be noted that the specifications in regard to friction and stretching tests of one of the roads referred to is what might be called a medium-grade specification, while the other seven specifications are what might be termed high-grade specifications, as understood by the rubber manufacturers. The committee has not sufficient data at hand to enable it to determine whether the medium-grade specification is of a sufficiently high-grade character to recommend its adoption. It is understood that specifications of this character are used by several roads, but as they have not been in use a sufficient length of time, the committee is unable to make any recommendation in that respect.

One road specifies that the hose shall be subjected to a flexibility test, which consists of mounting a test hose on standard fittings, ends rounded to prevent undue cutting of the tube, and placing on a vibrating machine; hose is subjected to air pressure of 60 lbs. to the square inch and must not fail in less than 75 hours. Three of the roads require that the hose be subjected to a kinking test, which consists in bending the hose until the ends are within 16 in. of each other. When placed in this position the hose must show no kinks. One road includes an expansion test, which consists in subjecting a portion of the hose to a hydraulic pressure of 100 lbs. to a square inch; hose must not expand more than $^3/_{16}$ in. in diam. under this pressure. The committee does not consider the above tests as being essential in the specifications which we recommend.

The committee has had access to records which have been carefully kept for the past two or three years, which show that fully 80 per cent. of all hose renewed has failed through chafing or cutting of the inner tube at the end of the nipple or coupling. Very few roads throughout the country have any device in use or have made any provision to overcome this chafing action on the inner tube of the hose, and in view of the committee's findings in this respect, it would recommend that some suitable device be used to prevent the injury to the inner tube at the coupling and nipple.

The roads in using specifications are largely overcoming the troubles which they formerly experienced with air hose bursting in trains. That specifications are as necessary in the case of air-brake hose as in any other important detail of car design goes without saying, if it is desired to maintain a uniformity in the grade of material purchased. The testing of hose to see that they comply with the specifications is not a difficult task, and it is urgently recommended that specifications be used by all roads in purchasing air-brake hose. In view of the practical unanimity in essential details of the specifications presented to the committee in response to our circular of inquiry, we would recommend the following specifications for adoption as "recommended practice" of the Association. These specifications do not differ materially in general from those recommended in the able report presented by Mr. A. M. Waitt, at the convention in 1898.

Specifications for Air-Brake Hose.

1. All air-brake hose must be soft and pliable and not less than three-ply nor more than four-ply. These must be made of rubber and cotton fabric, each of the best of its kind made for the purpose; no rubber substitutes or short fiber cotton to be used.

2. Tube must be handmade, composed of three calendars of $^1/_{32}$ in. rubber. It must be free from holes and imperfections in general and must be so firmly united to the cotton fabric that it cannot be separated without breaking or splitting in two. The tube must be a high quality of rubber and must be such composition as to successfully meet the requirements of the stretching test given below; the tube to be not less than $^3/_{32}$ in. thick at any point.

3. The canvas or woven fabric used as wrapping for the hose to be made of long fiber cotton loosely woven, and to weigh not less than 22 oz. per yard, and to be from 38 in. to 40 in. wide. The wrapping must be frictioned on both sides and must have in addition a distinct coating or layer of gum between each ply of wrapping. The canvas wrapping to be applied on the bias.

4. The cover must be of the same quality of gum as the tube and must not be less than $^1/_{16}$ in. to ⅛ in.

5. Air-brake hose to be furnished in 22-in. lengths. Variations exceeding ¼ in. in length will not be permitted. Hose must be capped on ends with not less than $^1/_{16}$ in. or more than ⅛ in. rubber caps. Caps must be vulcanized on, not pasted or cemented.

6. The inside diameter of all 1¼-in. air-brake hose must not be less than 1¼ in. or more than $1^5/_{16}$ in., except at the ends, which are to be enlarged $^3/_{16}$ in. for a distance of 2¾ in., the change from the smaller to the larger to be made tapering.

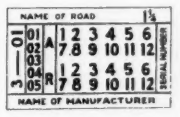
The outside diameters must be kept within the following dimensions:

The main part of hose 1⅞ in. to 2 in.

The enlarged ends $2^1/_{16}$ to $2^5/_{16}$ in.

The hose must be finished smooth and regular in size throughout as stated above.

7. Each standard length of hose must be branded with the name of the manufacturer, year and month when made, and serial number, the initials of the railroad company, and also have a table of raised letters at least $^5/_{16}$ in. high to show the date of application and removal thus: (See cut.)



Each lot of 200 or less hose must bear the manufacturer's serial number, commencing at 1 on the first of the year and continuing consecutively until the end of the year.

For each lot of 200 or less one extra hose must be furnished free of cost for test.

All markings to be full and distinct and made on a thin layer of white or red rubber, vulcanized, and so applied as to be removed either by cutting with a knife or sharp instrument.

8. Test hose will be subjected to the following test:

Bursting Test.

Test hose must stand for 10 minutes a pressure of 500 lbs. before bursting. Each hose must stand a shop test of 200 lbs.

Friction Test.

A section 1 in. long will be taken from any part of the hose and the friction determined by the force and the time to unwind the hose, the force to be applied at right angles to line of separation with a weight of 25 lbs. suspended from the separated end; the separation must be uniform and regular when unwinding; the average speed must not exceed 6 in. in 10 minutes.

Stretching Test.

A 1-in. section of the rubber tube or inner lining will be cut at the lapped or fixed part, marks 2 in. apart will be placed on it and stretched until the marks are 10 in. apart, then released immediately. The piece will then be re-marked as at first and stretched to 10 in., or 400 per cent., and will remain stretched 10 minutes; it will then be released and the distance measured between the marks 10 minutes after the release. In no case must test piece show defective rubber or show a permanent set of more than ¼ in. between the 2-in. marks.

Small strips taken from the cover or friction will be taken for the same test.

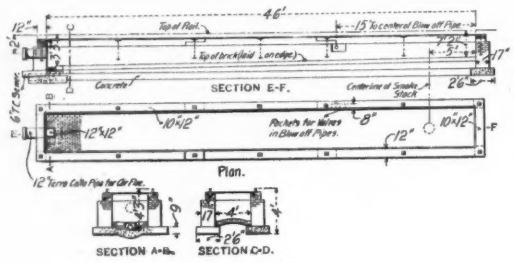
9. If the test hose fail to meet the required test, the lot from which they are taken may be rejected without further examination. If the hose are satisfactory the entire lot will be examined and those complying with the test will be accepted. All rejected hose will be returned to manufacturers, they paying feright charges both ways.

This report is signed by James Macbeth, H. F. Ball and R. N. Durborow.

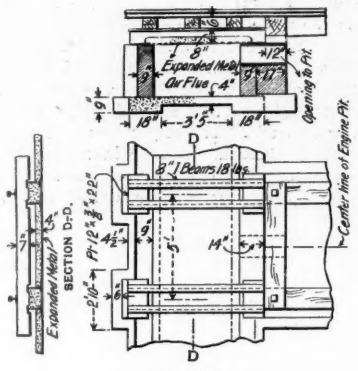
The Roundhouse of the Pittsburgh & Lake Erie R. R.

The Pittsburgh & Lake Erie has recently completed a new roundhouse at McKee's Rocks, Pa., which is the first building to be erected under a general plan for entire new shops and facilities for caring for locomotives and cars at McKee's Rocks. This roundhouse has a number of features which are different from the usual construction, and these are especially interesting at this time as roundhouse arrangement and accessories is a subject for report at the Saratoga meeting of the Master Mechanics' Association. The use of metal roof trusses makes it unnecessary to put posts between the pits; the windows are so arranged that the whole house is well lighted in the daytime, and at night electric lights are used. By the use of rolling steel doors the side of the house facing the turn-table can be thrown wide open. The heating and ventilating system is so worked out that at no time is the house filled with smoke or steam, and all the piping is below the floor, with the result that the appearance of the house is greatly improved. Briefly these are the features which one notices first when visiting this roundhouse.

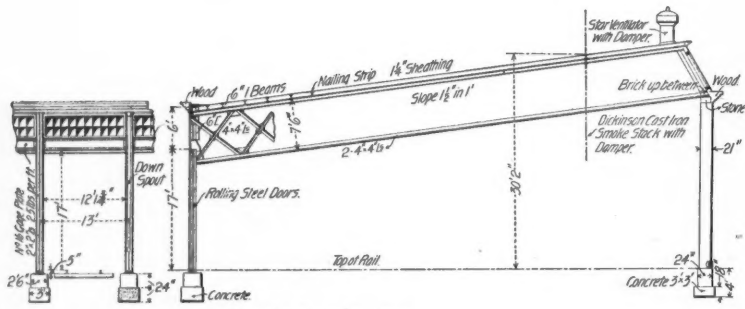
As shown by the accompanying engravings the turntable is 60 ft. in diameter, the posts supporting the inner ends of the roof trusses are 75 ft. from the center



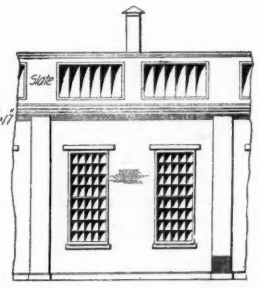
Engine Plan.



Air Flue.



Longitudinal Section.



Elevation of Outside Panel.

34-Stall Roundhouse at McKee's Rocks—Pittsburgh & Lake Erie Railroad.

of the turn-table, and the house is 75 ft. wide. From the inside of the wall to the front end of the pits is 11 ft. 6 in., the pits being 46 ft. long. The house, as built, has 29 pits, two of which are drop pits. If extended to make a complete circle there would be 34 pits with one track to and one track from the turn-table.

The outer wall is brick on concrete foundations with two large windows so placed that the light enters on either side of an engine standing over a pit. In addition to these, large windows are placed near the roof and between the trusses, which are very effective in lighting the house farther back from the wall. Ventilators made of copper and fitted with 2-in. dampers are placed at the highest point of the roof and above every other pit. Above each stall is a Dickinson cast iron smoke jack, which can be adjusted to fit tight about the smokestacks of locomotives. These devices, in connection with the system of heating and ventilating and the pipes for blowing off engines, keep the house free from smoke and steam. At the opposite side of the house wide windows are placed above the doors. The building is lighted artificially by its own electric plant. An inclosed arc lamp is suspended between each stall, and each lamp has its own drop switch, which can easily be reached from the floor to allow it to be cut out when not in use. There are also arc lamps placed on brackets outside of the roundhouse to light the space around the turn-table, and other arc lamps are located near water plugs. Incandescent lamps are placed at the work benches around the outer wall.

The outer wall supports the roof trusses at one end and at the other there are steel posts spaced 13 ft. center to center. Above the doors the trusses are tied together by 6-in. channels and angles. The roof is made of 1¼-in. matched yellow pine dressed on one side and covered with ordinary tar and gravel roofing material. The roof has a slope of 1½ in. in 1 ft.

The clearance at the doors is 17 ft. As said steel rolling doors are used, part being Kinnear and part Wilson doors. These can be rolled up out of the way in fine weather, leaving the side of the house next the turntable wide open and letting in plenty of light and air.

The pits have brick walls on concrete foundations with a 10 x 12-in. timber turb. The pit floors are brick sloping toward the turn-table, and the sewer connection is made at that end. The floor between the pits is wooden planking. The first ten pits, including the two drop pits, are arranged with pipes for use in blowing off locomotive boilers so that the steam blown off will be carried out of the house. This steam will be used to heat water for washing boilers. Compressed air and steam are piped to each engine pit for use in operating drills, blowers, etc. All this piping is run under the floor and alongside the outer wall of the house, with branch pipes extending between the pits as shown by the plans. All the piping is accessible, and is free to expand and contract.

The house is heated and ventilated by warm air, the Sturtevant system being used. The fan and heater is located in an annex just outside the roundhouse. In this case the air ducts are of brick built beneath the floor. The main duct extends from the fan to the opposite side of the house, where it divides into two branches, each branch running half way around at the rear of the engine pits. From these ducts there is a 12-in. circular opening into each pit, fitted with a damper to control the discharge. No difficulty has been found in heating this house to a temperature of 60 deg. Fah. during zero weather with only the exhaust steam from a 50 h.p. engine.

Just outside of the roundhouse in an annex is the power plant, including a boiler, engine, generator, air compressor, ventilating fan and water pump. This pump takes water from the shop water tank, and delivers it at the required pressure at the openings in the floor between the engine pits.

We are indebted to Mr. A. R. Raymer, Assistant Chief Engineer of the road, for information and drawings.

The Railroads of the Cape of Good Hope.

On the 20th of April the General Manager of Railways of the Cape of Good Hope submitted his report for the year 1900, a copy of which has lately reached us. This report is signed by Mr. C. B. Elliott, who has been General Manager for many years. On the 8th of May he reached his 60th birthday and then retired, giving place to Mr. T. R. Price (lately Chief Traffic Manager), whose succession to this office we recently mentioned. Mr. Elliott had been 42⅓ years in active service in a great variety of offices and felt that it was his privilege (and almost a duty to himself) to retire. He remains in special service, however, for still another year.

The net earnings on the capital entitled to interest for the year 1900 amounted to 6¼ per cent., which was an increase of 1.6 per cent. over the year 1899. This increase was due to the immense military traffic; naturally the civil traffic was much reduced. The earnings were, in fact, the largest ever made by the Cape Railways, excepting in 1895 and 1896, when the Orange Free State roads were included in the Cape Colonial system. The train miles run during the year amounted to 9,400,000, as against 8,000,000 the year before. The net earnings per train mile amounted to 69 cents, or 9 cents more than in 1899. The effect of the war on civil traffic has been disastrous, as great quantities of freight have been delayed at seaports for want of conveyance up the country, but the staff of the railroad department have worked harmoniously with the military authorities almost without exception, and have received high commendation from Lord Roberts.

During the year nearly $2,000,000 was spent in new and additional works and charged to capital account, almost half of this being for rolling stock. The General Manager suggests the relaying of all lines with heavier rails, also the reduction of grades and increase in radii of curves.

The expenditures due to damages by the Boers have necessarily been large. A great number of small bridges and culverts were destroyed, not to mention the large bridges over the Vaal and the Modder. Furthermore, the cost of engine coal has been very high.

In the report of one of the staff officers we find a suggestion which seems important and which is in line with what we have long considered a fundamental principle. This officer protests against the notion of opening up the agricultural districts of the colony by what he calls "little railways," meaning roads of 2 ft. gage. In his opinion the standard gage of the colony (3 ft. 6 in.) is already quite narrow enough, and in that we agree with him, and indeed have no hesitation in predicting that within some not very long period the people of the colony will regret that their gage is not 4 ft. 8½ in. A serious objection to introducing another gage for the very light railroads is that the rolling stock which has become outclassed cannot be transferred to those roads for use. If, however, these agricultural roads are to be built to 2-ft. gage this officer suggests that the light rolling stock of the existing roads should either be sold or confined to work.ng along the coast and kept off the main line.

Safety of Employees in England.

The British Board of Trade has issued a code of rules for the guidance of the railroad companies of the United Kingdom in the carrying out of the law passed last year for the prevention of accidents to railroad employees. Before final adoption these rules will be submitted to the criticism of the railroad companies.

There are 13 rules, the substance of which is as follows:

1. Within five years wagons (freight cars) must have brake levers on both sides; after one year from the time the rules go into effect no new or rebuilt wagons shall be used without brake levers on both sides.

2. Labels (car cards), when used, must be made in duplicate, so as to have one on each side of the wagon.

3. After one year, cars must not be "propped" (cars on one track pushed, by means of a pole, by an engine on an adjoining track) except in case of absolute necessity arising from accident or other emergency. Also tow-roping (pulling of cars on one track by an engine on an adjacent track) is forbidden, except in cases where there is no other way to deal with the traffic.

4. Within two years all engines and tenders must have power brakes.

5. Stations or sidings where shunting is done after dark must be sufficiently lighted; where necessary the Board of Trade will issue orders on this subject.

6. Rods and wires running to switches and signals must, within two years, be sufficiently covered or otherwise guarded. Ground switch levers must be so placed as to cause as little obstruction as possible to employees.

7. If the Board finds any office or cabin situated too near the track or, in any place, to be a source of danger to employees, it may order alterations.

8. Within six months fouling points must be marked; that is to say, where two tracks run within less than six feet of one another a post or other mark must be set; but the mark must not be placed so as to be a source of danger.

9. Gage glasses on boilers, of both locomotive and stationary engines must, within three years, be protected by a sufficient guard or covering, and must have a sufficient automatic shutoff valve.

10. Tool-boxes on engines and tenders must be so placed that the men can get at the contents of the boxes while the engine is in motion, without risk. Within three years water gages must be provided on tenders, in such place as to be visible to the men without their incurring undue risk.

11. Trains not having continuous brakes must have brake vans.

12. Where important track repair work is going on, where danger is likely to arise, the company must provide persons for the express purpose of maintaining a good lookout for trains.

13. If necessary to avoid interruption of business the Board may grant an extension of time in respect to these rules.

Low-Price Weekly Tickets in Europe.

From a report made to the British government it appears that in Belgium season tickets are sold to workmen going to work daily in cities at 5 cents a day for distances of 20 kilometers (12.4 miles) and for other distances in proportion. Tickets are sold for one week at a time. They are available only for men doing such work as is essentially manual; men must not be working on their own account and the work must not be of an artistic nature. For 6.2 miles the weekly rate is 1 franc 25 centimes (25 cents); 12.4 miles, 1 franc, 50 centimes; 24.8 miles, 2 francs (40 cents). For the shorter distance the rate is a third of a cent a mile; for the next 2.6 mills a mile and for the 25-mile trip two mills a mile. Reports were also received from France and Germany, but they are not so complete. On the Western of France, the price for 6.2 miles is 26 cents a week. These tickets are good only on certain trains, but workmen can go and come at noon as well as at morning and night. The ticket buyer must have a certificate from the Mayor, or comply with certain other regulations to prove that he is a workman, and his income must not be over $400 a year. No baggage will be carried in the baggage car for these passengers, except their tools. In Germany, the rates are given in pfennigs per kilometer, but the distances for which the special tickets are sold are not

given. The rates vary from three mills to four mills per mile. Documents to show that the applicant is a workman appear to be required on some railroads, but not on others.

Atlantic Type Locomotives for the Long Island.

The Baldwin Locomotive Works recently built for the Long Island Railroad Company two Atlantic type fast passenger locomotives, a half-tone illustration of one of them being given herewith. These are the first Atlantic type engines that have been used on the Long Island Railroad, and they are running between Long Island City and Montauk. There are no special features about them, and they conform to the general lines of this type of engine. The Long Island has recently added to its motive power three 20 x 26-in. 10-wheel locomotives

Baldwin Atlantic Type Locomotive—Long Island Railroad.

which will be used in service similar to that in which the Atlantic type engines are working. A general description of the Atlantic type follows:

Cylinders:	
Diameter	19½ in.
Stroke	26 in.
Valves	Balanced
Boiler:	
Diameter	64 in.
Thickness of sheets	11-16 in.
Working pressure	200 lbs.
Fuel	Anthracite, bituminous, or mixed
Fire-box:	
Material	Steel
Length	113¼ in.
Width	96 in.
Depth	60½ in. front; 52½ in. back
Thickness of sheets, Sides, ⅜ in.; back, ⅜ in.; crown, ⅜ in.; tube, ½ in.	
Tubes:	
Material	Iron
Number	297
Diameter	2 in.
Length	16 ft.
Heating Surface:	
Fire-box	180.5 sq. ft.
Tubes	2,476.8 sq. ft.
Total	2,657.3 sq. ft.
Grate area	75.5 sq. ft.
Driving Wheels:	
Diameter outside	76 in.
Diameter of center	70 in.
Journals	9 in. x 12 in.
Engine Truck Wheels:	
Diameter	36 in.
Journals	5½ in. x 10 in.
Trailing Wheels:	
Diameter	56 in.
Journals	8 in. x 12 in.
Weight:	
On drivers	97,850 lbs.
On truck	35,060 lbs.
On trailing wheels	33,200 lbs.
Total engine	166,110 lbs.
Total engine and tender	266,000 lbs.

The Telephone in Railroad Service.*

The growth of railroad telephony in the last few years shows a gradual evolution from a public telephone on a party line with old-fashioned equipment, located in the general office or freight office of a railroad, to complete exchange systems with long-distance lines, handling a business of large volume. It is estimated that in the United States there are 200 private branch exchanges operated by railroad companies, connecting over 5,000 stations. A large proportion of these have been installed within the last three or four years. With the rapid increase of telephones in business houses, with the improvement in equipment and service, and the gradual reduction in rates, the demand for communication with railroad companies increased rapidly, and finally resulted in the establishment of private exchanges operated by the railroad companies. At first, only offices having business to do with the public were connected, allowing, perhaps, one telephone in each department. But the results quickly led to a rapid extension to freight yards, towers, switch cabins, etc. The saving in time and messenger service produced economies so apparent that to-day few large railroad companies are not equipped with this service. The public has grown to expect that information shall be furnished by telephone rather than by letter or telegram.

The telephone is now put to many uses. Starting with the ticket offices, it is astonishing how many calls there are for reservations, information as to the time of arrival and departure of trains, etc. Many ticket offices at large terminals have special equipment to handle the immense volume of business. At the ticket office of the Fall River Line in New York, one of the busiest in the country, even with a branch exchange having five trunk lines to the public, with a telephone in the ticket office, with one man giving his entire time to the reservation of staterooms, and with the switchboard operators relieving him of many calls by giving general information when reservations were needed, the lines were reported "busy" 1,600 times in one day. As may be imagined, such a state of affairs brought serious criticism from the public, and it was necessary to double the number of trunk lines, holding them exclusively for incoming business while other lines were put in for the outgoing traffic. A small turret switchboard was set up in the ticket office, having several lines to a main branch exchange switchboard. This enables the clerk in the ticket office to handle several lines at once, and in an emergency two clerks could be taking the calls and giving out the reservations. When the number of calls for the ticket office was greater than could be handled on the lines between the switchboards, the operators were instructed to take the numbers of the subscribers and call them up in rotation as they were able to handle them.

At one of the largest freight yards in this country, having a completely equipped branch exchange connecting all points throughout its various houses and yard points, a person expecting incoming freight, upon obtaining connection with the switchboard and stating what is desired, is promptly connected with one of three clerks whose duty it is to furnish such information. These clerks, by the use of various direct lines to the offices concerned, are able within a minute or two to give the calling subscriber definite information as to arrival or non-arrival of the desired freight, and, if it has arrived, to inform him at what door of a certain freight house his teamster should go to find it. Many consignees are notified at once by telephone of the arrival of freight, thus securing prompt removal of the goods. As telephone users increase in number, it will undoubtedly be found more satisfactory to all concerned to notify by telephone rather than by mail, and, with proper precautions, a record and check of the receipt of the notice may be kept. While many question the advisability of giving rates over the telephone, the cases of dispute in regard to the rate quoted form a small percentage of the whole, and, in important cases, the rates quoted may easily be confirmed in writing.

Where freight is transferred from one road to another, cars not accompanied by way bills may be saved needless switching by prompt communication, and in many instances it will mean a saving of 24 hours in forwarding a car. Way bill corrections may be made by telephone.

The telegraph lines of a railroad are often burdened with much short distance business that could be transacted far more quickly by telephone. Yard offices within half a mile of the main office are handling telegraph messages on through wires, delaying other business, when a few dollars expended on telephone circuits would relieve the situation and give better satisfaction.

Where there is much competition for business between different roads, it is often necessary for a traveling agent to get into immediate touch with his superior. Insufficient telephone equipment, resulting in the constant inability of prospective shippers to get into communication with railroad offices will often lose a large amount of business. A certain telephone company, noticing such a situation, took pains to have the lines of two competing railroads monitored, and the road whose telephone was constantly reported "busy" was found to have lost enough business to its competitor in one day to pay the rental of a complete branch exchange for a year. In one case at a large terminal embracing six large freight yards within a distance of nine miles, through all of which runs a double track main line traversed by several hundred trains a day, every tower and switch cabin is connected to a switchboard in the passenger station, keeping despatchers, yardmasters, towermen and switchmen in close touch with one another.

Many switching movements have to be made on and across the main tracks. With the telephone it is possible, in case the main line trains are delayed, to continue switching movements longer, so that delays are avoided. The yardmaster is enabled to follow movements closely by being kept informed from the various points; and a saving of two switch engines has been effected over the number in use before the telephone service was installed.

One of the largest passenger terminals in the country has a very complete telephone service, the main exchange being located in the office building. Every official has direct connection from his desk to the exchange. The general yardmaster, the trainmasters, towers and cabins are all connected to the switchboard, besides having direct lines to the points with which they have most business. The main interlocking tower which controls all the yard movements incidental to handling 750 odd trains a day, has a special switchboard, to which are connected the outlying towers, switch cabins, yardmasters' offices, signal bridges, etc., with trunk lines to the main exchange. Incoming trains are reported by telephone. Not a telegraph instrument is in use at any of the yard points, the telephone being the only means of communication. The yardmaster also has a small switchboard, giving him direct connection with the various points he has to reach. In case of a bad fog, when the signals cannot be readily seen, men are stationed at the signal bridges on which are placed telephones in boxes connecting with the switchboard in the interlocking tower and the trains are handled without delay and safely. There is hardly a place in the immense plant where any man is stationed, having special duties, that cannot be reached at once by telephone. All wires are underground—not an overhead wire in the yard—and there has yet to be an instance of any failure in the service night or day.

In installing telephone systems a great mistake is often made by railroad companies in endeavoring to economize in the number of instruments. Enough should be provided to care for every branch of the service under any conditions that may arise. This is especially true in relation to offices handling train service.

The branch exchange should not only afford connection with points in the immediate vicinity of the terminal, but it will be found advantageous to extend the lines to the outlying towers and stations, supplementing the telegraph service, and in many cases economizing in the number of telegraph operators it is necessary to employ, as there are many stations and towers where it is unnecessary to issue train orders, and the use of the telephone relieves the telegraph wires of miscellaneous business.

If a pair of wires is run along the main line through the more important divisions, such wires become valuable in emergencies. If a wrecking car is equipped with a compact telephone set, as soon as the car arrives at the scene of the wreck, instant communication may be made with division headquarters by means of these division lines. Several instances have occurred recently demonstrating the value of this emergency service. A telephone was attached to a telegraph pole within a few feet of the wreck. The Division Superintendent, who was on the ground before the wrecking car arrived, was able to keep in touch with the despatcher and the towers on each side of the wreck, and, as soon as one track was clear, moved a number of delayed passenger trains with little loss of time. In this case no telegraph was available, but even if it had been the work could not have been accomplished so well or so quickly. These wires running through the division, connecting towers and stations, also become valuable to section foremen and signalman to communicate with headquarters, if a test set is carried or telephone boxes are established at intervals. An emergency telephone set might be carried in the baggage car of a train, enabling a train disabled between stations and towers to report the trouble at once.

It is of great advantage to connect the various block signal stations by telephone as well as by telegraph, thus relieving the train wires of messages between towermen, which they are often unable to send promptly as the wire is in use for train orders. A simple expedient is to utilize two of the wires used for the bell or locking circuits between towers. By the use of a two-way strap switch, a telephone may be thrown into the circuit on either side, and the towermen may hold communication. In some instances block stations on entire divisions have been equipped by telephone, and all business with and between the towers is transacted by telephone. This has a distinct advantage in the fact that special training is not necessary in the towermen, as they may be recruited from the men having actual experience in the handling of trains, and not necessarily telegraph operators. It also affords a field for employees of the road who have been disabled in the service, and are unable to take other positions.

The railroads terminating in New York and Jersey City have a problem which does not confront roads in inland cities, in having to float many of their cars from the docks of one road to the docks of another. The railroad having the largest floating equipment moves in this manner about 2,000 cars a day. This float service is necessarily slow, and, to obtain the best results, must be under a control similar to the train service. This has been accomplished by establishing a telephone despatching system, so that the various captains of tugs and the floatmasters report and receive orders both on arrival at and departure from the terminals. The yardmasters are notified of these movements, and, knowing what cars to expect, can arrange for prompt movement; and an appreciable increase has been made in the number of cars handled daily.

Only recently has progress been made in connecting railroad terminals by long-distance lines. The fact that a general officer, sitting at his desk, can communicate almost instantly with his subordinates at all points on the line effects great economy. The fact that principals can deal direct with one another instead of through the medium of a telegraph operator has much to do with

* A paper by F. P. Valentine, Superintendent of Telephones of the New York, New Haven & Hartford, read before the Association of Railway Telegraph Superintendents at Buffalo, June 20.

this. Five minutes' conversation will often accomplish more, with definite results, than half a dozen letters or telegrams.

While the expense of installing these lines makes it necessary to economize in their use, it is astonishing how much business may be transacted daily over one pair of wires. The average time consumed per connection on railroad business for calls between distant points appears to be about 3½ minutes. This would permit in nine hours about 150 messages. If such lines extend over a large territory, connecting several switchboards, the different parts of a line may, of course, be worked simultaneously. To obtain the best results a careful study should be made of the use made of the lines by the various departments and of the handling of the calls. This will show that by systematizing it is possible to increase the capacity of the line surprisingly.

A long-distance line in operation by one of the leading railroad companies of the country, connecting exchanges in four cities on its main line, thus breaking the line into three sections, is handling 250 calls a day, and it is not thought that the maximum capacity of the line has yet been reached. The operators have been carefully trained in the handling of the calls for the various officials, preference being given to those highest in authority. By discriminating between the various calls asked for, and by intelligent operation, practically instant service is afforded the executive officers, while other calls of importance are handled next, leaving less important business to fill in the time on the wire. To accomplish such results a system of tickets, carefully checked, is necessary. These tickets should show time call was received, forwarded, connected and disconnected, with a code record of all attempts made to complete connection, reasons for delays, etc. From these tickets a chart can be readily made showing just what the line is doing at any minute during the day. From such a chart defects in operation can be immediately detected and corrected.

Good construction of lines is important. Roads not equipped to build telephone circuits will find it more economical to lease them from the telephone companies; but as their needs increase, they will find it to their advantage to organize a force of experienced telephone men to install and care for these circuits. Against the cost of these lines should be considered the saving. In the instance cited of the line handling 250 calls a day, it is estimated that 10,000 letters and telegrams a month are saved.

It is possible with experienced men to maintain telephone circuits on the right of way of the railroad company, if necessary, running them upon the telegraph poles, but careful attention must be paid to details. Induction from high tension currents will give more or less trouble, but this can usually be overcome by careful transposition of the circuits. At terminals it will be found most economical in the long run to do away with overhead construction and provide a liberal equipment of underground cable, figuring a large surplus capacity for future growth. The maintenance cost of such a plant is small, and in a few years it will pay for itself in the saving in the cost of maintenance over the open wires. It will be found advantageous also, where there is heavy suburban railroad traffic, to extend the cable beyond the terminal limits. In the case of one road doing a heavy four-track suburban business, covering a distance of ten miles, from the terminal station, it has been found economical to run a lead-covered paper cable on the telegraph poles the entire distance, utilizing the conductors for both telephone service and the various signal circuits between the block towers. In this case it was impossible to find room on the existing pole lines for the necessary number of open wires. It was found possible to install this cable quite economically, as it was run from a work train running at a low rate of speed, the suspension wire having been put up first, and over 1,000 ft. an hour was run.

It is also possible by using cable to elaborate the telephone service by utilizing the dead ends of the circuit terminating at various points, thus affording additional direct connections between towers and points having much intercommunication, simply adding small switches to the telephones and thus relieving the main switchboard of much work.

The equipment best suited to the needs of the various departments is worthy of some attention. Originally a desk stand set was considered somewhat of a luxury, but in the case of an official having to answer from 30 to 40 calls a day, much time is saved by the telephone being right at hand. In the case of one or two railroad exchanges connected by a long-distance line, one being equipped mostly with wall and the other with desk-stand sets, it was found that with the wall sets it took on an average fifty seconds longer to get the party ready to talk than with the desk stands, which, on the number of long-distance calls per day, amounted to a loss of one out of six busy hours in the use of the circuit. The rental of the line amounted to several dollars a day, while the cost of desk equipment was but a few cents a day.

In developing a railroad telephone system, uniformity in equipment is essential, as, sooner or later, a large proportion of the telephones will be brought into the general branch exchange system. Private lines are built at different points, and as the circuits from the principal centers are extended, it will be found of advantage to arrange switching connection with these private lines. If uniform equipment is adopted, changes in the instruments will not then be necessary.

To obtain the best results with a system having several hundred miles of wire and several hundred instruments to care for, there should be a properly organized force to make regular and systematic inspections and repairs, and care for instrument and line troubles on short notice. This force should be preferably composed of experienced telephone men, as the average telegraph or signal linemen lack the necessary training to produce the best results.

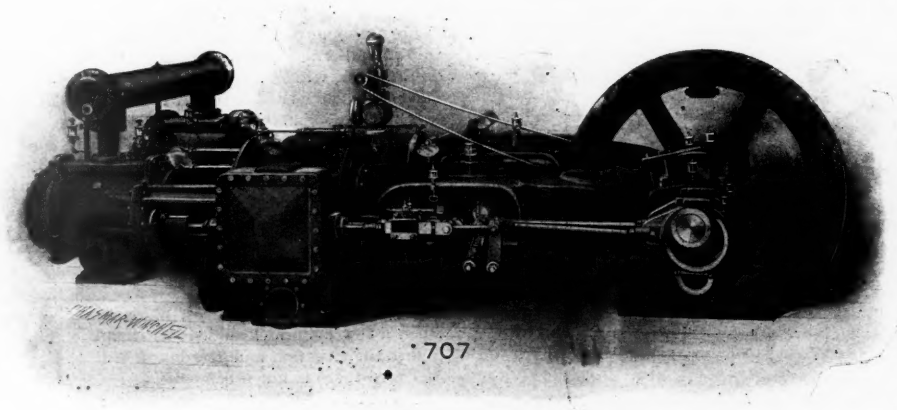
The extension of the branch exchange system is not confined to points on the railroad premises, but direct connections are made from switchboards to the residences of officials. . . . A great deal of dissatisfaction with telephone service is occasioned by the fact that only about one in ten users know how to talk properly. Telephone users should be taught how to use the instrument and also to express themselves clearly and concisely; much time is wasted in needless repetition. . . . It has been found of advantage to utilize stenographers in connection with switchboard operation, that messages may be taken in the absence of the party desired and on his return can be delivered to him. The use of stenographers and typewriters in connection with railroad telephone service will undoubtedly be developed with the extension of the service, as it is possible for an expert typewriter to take direct from the telephone at a greater speed than from the telegraph.

When railroads have equipped themselves so that they can care for their commercial and domestic office business, the question of train operation by telephone instead of by telegraph will be settled on its merits; but this should not be attempted until the equipment is sufficient and suitable, and the service is brought up to a standard that will compare favorably with that furnished by the more progressive of the telephone companies. Much of the criticism as to the danger of transmitting train orders by telephone has been justly based on the poorly constructed lines and cheap equipment used by many of the railroads, under the belief that economy in initial cost is the principal thing to be considered. In itself the substitution of telephone for telegraph is no more radical a change than took place when reading by sound supplanted the use of the register on the telegraph wires.

It can be predicted that the next few years will see some developments in the application of telephony to railroad service that will surprise some of those whose conservatism has led to the long delay in the appreciation of what seems destined to become the chief means of communication in the future.

The "Cincinnati" Air Compressor for Railroad Shops.

The engraving illustrates a line of compressors now being brought out for railroad shop service. The most striking departure is in the frames, which are of the center crank or fork pattern, affording a bearing on either side of the crank. The crank shaft itself differs radically from the built-up construction incidental to the girder frame; in the fork frame type here illustrated cranks, crank pins and shaft are turned up from a single steel forging. A similar crank shaft is used in marine engineering, and the experience of the manufacturers since the adoption of the type some years ago has proved its fitness for the most exacting air compressor work.



The "Cincinnati" Air Compressor for Railroad Shops.

The fork frame also allows the location of the steam valve gear either outside or between the cylinders. By the former arrangement both valve gears have been brought into full view and easy access from the outside; the necessity for wide centers having been thus removed, unusual compactness is possible accompanied by a gain of convenience. Large bearing surfaces and easy means for taking up wear are provided throughout the Meyer valve gear shown; the cut-off index and adjusting rigging is novel and substantial. In the cross-compound arrangement illustrated a reheating receiver is placed between the frames.

The re-cooler on the two-stage air end is formed of small straight non-corrosive brass tubes held between the two tube plates by stuffers which allow ample expansion and contraction; the circulating water passes through these tubes cooling the air in the receiver space. A pocket, provided with a water gage is so placed as to prevent the entrance of leakage or condensed water into the high pressure air cylinder.

In this latter cylinder poppet air valves of a new self-contained type are fitted. The valve seats are of bronze and are continued upwards to form cages and guards for the valves themselves. The entire valve mechanism is thus contained in a single part independent of any outside adjustment for its proper operation. It is screwed into the cylinder head and securely locked and may be removed bodily and replaced in a very short time. The suction valves are of a special bronze composition; the discharge valves are light and durable steel forgings.

On the low-pressure air cylinder mechanically moved valves are fitted, the gear, unfortunately, not being very clearly shown in the cut. The valves are of the semi-rotary Corliss type and are positive in action throughout, being nowhere dependent upon springs, dashpots or lost motion. Each valve opens to the air a single short passage, through which flow is easy, and in which, owing to the size of the air stream, and the effectiveness of the water jacket the heating effect of the surrounding metal is much less than when air flows in fine streams through a number of small valves. This feature, together with the low clearance obtainable with this type of valve give to the cylinder an exceptionally high volumetric efficiency. The suction and discharge valves respectively are driven from independent eccentrics and wrist plates, are easy of adjustment, and free from noise and rattle in operation.

The "Cincinnati" compressor illustrated is built by the Laidlaw-Dunn-Gordon Co., of Cincinnati, Ohio. Their "Fork Frame" line covers, in addition to the cross-compound shown, single and duplex simple machines in both Meyer and Corliss steam valve gears.

The National Metal Trades Association and the Machinists' Strike.

We have received copies of resolutions adopted at the June convention of the National Metal Trades Association. Also copies of its Circular Letter No. 30, Declaration of Principles, and a definition of its position in regard to the machinists' strike. The charge that the International Association of Machinists has been guilty of bad faith and has violated distinct agreements previously made is the keynote of all of this matter, and the attitude and contention of the National Metal Trades Association is stated as follows:

"Moreover, in numerous cases and through widely separated localities the union machinists have flagrantly restricted the production of the shops, denied flatly the right of the employer to govern his own affairs, and have interfered with the management and methods of our shops, and it is this point which we declare to be the issue which we defend in this contest.

"As regards wages this association has from the start declined to take any national action and has made no agreements, actual or implied, with the International Association of Machinists on this point, reports to the contrary notwithstanding. We believe that the question of wages is a commercial one between the individual employer and his employee, governed only by natural economic laws and varying with conditions and localities and a subject which it is not proper nor possible that an Association such as ours should deal with. This question of wages was discussed at great length when the contract of May, 1900, between our Association and the International Association of Machinists was made and the verdict as given above was concurred in unanimously by both parties to the agreement, as the records of said meeting and the Joint Agreement shows. We therefore decline to admit wages as a national issue and declare it a local question.

"Our position therefore is as follows: We declare that the Machinists' Union has through its national and local officers broken faith with us and proven themselves to be an irresponsible body, with whom we can make no contracts that will be binding upon them. We recognize the right of any man to belong or not to any religious, political or economic sect as he may see fit; also his right to leave our employment at his free will, and his right to sell his labor at the best price he can command. We maintain our inalienable rights to employ a man whether he belongs or not to any organization and at wages mutually satisfactory, and also to discharge him at our discretion. We insist that the management of a shop is in the hands of the employer and is not to be interfered with by the employee. We insist that a

fair day's work shall be given for a fair day's wage and we will give a fair day's wage for a fair day's work. We believe that a shortening of the working hours or an increase of wages can only be brought about by the hearty co-operation of employer and employee in advancing and not in retarding production and by introducing and not fighting improved methods. We decry strikes and lockouts as unbusinesslike and unnecessary and believe that all disagreements can be adjusted by other means and the condition of employer and employee both benefited more by harmonious progress than by strife and discord."

How to Test the Efficiency of a Car Service Association.*

BY A. L. GARDNER.

A large amount of money has been expended by the railroads of this country in establishing standards of work and construction; standard code of train rules; standard methods of accounting; standard parts in cars, machinery, etc. Why should we not have a uniform standard for the operation of Car Service Associations? Uniform rules are probably out of the question, but the exceptions might be a great deal less numerous than they are. The American Railway Association has spent a great deal of time in the investigation of many subjects; I believe if this one were properly prepared and presented to it the matter would be considered as worthy of attention.

Comparison Test.—How can we test the efficiency of a car service association? In view of the crude and variable methods in vogue, can it be done by comparison? No fair comparison can be made between two Associations unless the conditions are similar or are fully considered. The Car Service Association is a local institution. While the rules are in some respects common to all, they are not enforced alike and methods of application vary according to views of manager or governing board. These diverse conditions are far-reaching in their results. Extent of territory covered, number and size of stations, nature and volume of traffic, support given by the members, and the character and qualifications of the manager are all factors which must be given due consideration. We have all kinds of reports. Some things of little or no value are figured out with great nicety, while others of great importance are omitted altogether. I have the reports for April of two of our largest associations. The number of cars handled, average detention and expenses, are about the same, while the net collections of one are over $31,000 and those of the other less than $5,000. A certain road handling 15,000 cars at about 60 stations in a given territory collects $600, while the same amount in another territory is collected on less than 3,000 cars. These are striking figures, the explanation of which can only be known by familiarity with conditions and the different methods of accounting. Certain commodities will move inside of 48 hours with little or no charges accruing, while others cannot and will not move inside of 96 hours, and even pay large demurrage charges under this limit.

Average Detention Test.—Emphasis has sometimes been placed upon this. Average detention is merely the exponent of certain conditions. Some car service associations are so situated that they will have very low detention any way; but this is no indication as to general results. In some instances of the lowest detention we have the greatest earnings. Low average detention might result from a large number of manufacturing plants and ample terminal facilities; the absence of these conditions will produce a higher detention. Some associations report both consignee and railroad detention, while others report consignee's detention only. All associations count detention from arrival, but "arrival" is considered in various ways; in some instances from arrival of road trains in outer yards, in others cars at this point are considered as "in transit" and are not considered as arrived until they are moved to the terminal delivery tracks. With this diversity of practice low average detention is of no value for purposes of comparison, unless all the conditions are known.

Average Cost Per Car Handled.—This has been claimed as an important item. What possible relation it can bear to the proper enforcement of the regulations is not easy to see. Certain fixed charges are about the same in all the associations. The average cost per car handled is no indication that earnings are collected or the rules properly enforced. Besides, the cost per car handled is only one-half of the problem. Take the two large associations previously quoted. The average cost per car handled in each is about the same, while the net revenue per car in one is 2.05 cents, and 26 cents in the other. Any association that is doing good work in accelerating car movement is worth what it costs whether that be 2 cents or 5 cents per car.

Percentage of Earnings Collected.—The real test is the percentage of earnings collected. Money not only talks; it moves the car. It is the most potent factor in enforcing car service rules. In this, practice is as variable as in any of the other aspects I have mentioned. I saw a report the other day in which less than 20 per cent. of the current earnings were collected; and bills accrued in September and October were paid in April. Verily, the query, why is not the car service dollar as good as any other, has not yet been answered entirely. The factor next in importance, probably, is the amount of "eternal vigilance" displayed by the manager. I do not know why it should be infinitely harder to secure careful attention to this work than to any other, but so it seems. The $35 clerk cannot fill a $50 position here any more than in any other department of railroad work.

The true results of the car service association are indirect and invisible and cannot be shown in figures. The association must be judged in the same way as that of any other department—by the work it is doing, and what yet remains to be accomplished. The Trunk Lines have reduced the ton-mile charge from 1.61 cents in 1870 to 0.51 cents in 1900. In this grand result car service has played its part. A modern railroad president said, "the life of a railroad is in its cars," and under this shibboleth proceeded to increase his equipment by scores of thousands of cars. A live superintendent, now president, once said in addressing this body, "the only way to get anything from the movement of freight, is to make the movements with increased rapidity and frequency," and the true value of the car service association is the measure in which it expedites car movement by decreasing detention.

The only true comparison is inside the bounds of each association—what is, as against what was. How many blades of grass have you made to grow where one grew before? How many switching engines and crews have been laid off? What additions and improvements have been made at terminals, and what are the returns upon the investment? We have seen terminals of greatly inadequate facilities with 200 to 300 cars constantly standing out from one to three weeks, transformed so that cars are promptly placed upon arrival, and $600 to $700 demurrage collected every month. Isn't that a good investment? We have gone into a district where no rules previously existed and the average detention was over 12 days per car, and by patience and perseverance have seen the average detention reduced to less than 3 days per car. We have seen the operation of large plants handling between 3,000 and 4,000 cars per month, so improved, that an average detention of between six and seven days per car has been reduced to an average of 36 hours per car. These are the comparisons that are worth while, and are the only ones that are of any value. It is along these lines that our interest lies, and the conservatism and perfecting of these splendid results may well engage our best efforts.

*A paper read before the annual meeting of the Association of Car Service Managers, at Denver, June 11. Condensed.

Report on Steam Turbines.*

The author studied the construction of revolving turbines in one piece, to run safely at very high speeds, up to 20,000 revolutions per minute, together with the equilibrium of the turbines, and the friction of the revolving parts in the steam. A one-disk turbine is described, with drawings, driving a dynamo by means of wheels; another to drive a fan coupled direct, and a two-disk turbine driving a centrifugal water pump direct. Several thousand experiments were undertaken on a turbine 30 centimeters diameter, and developing up to 65 effective horse-power. They were intended to determine the consumption and most economical type of turbines and of nozzles, and speeds of rotation. The pressures of steam varied from 2 to 11 atmospheres, the number of revolutions per minute from 14,000 to 20,000. The theoretical consumption of steam and electrical horse-power exerted being known for a given turbine, the efficiency is calculated for some forty experiments, both with and without condensation. The correctness of the Williams law for these turbines, as well as for reciprocating piston steam engines, was also demonstrated. To diminish the number of steam nozzles for the same power was found of advantage.

A steam turbine with a number of disks is next considered, and a drawing given. To increase the number of disks has the effect of allowing the turbine to run slower. It is desirable thus to reduce the number of revolutions per minute, because various machines can then be driven direct from the turbine. An important point is to diminish the unavoidable clearance between the revolving and the stationary parts of the turbine, and thus to lessen the leakage of steam. With steam of 13 atmospheres pressure the consumption may, it is hoped, be reduced in a multiple-disk turbine to 5.7 kilograms per b.h.-p. hour = 12½ lbs. Four turbines with many disks, each of 1,200 h.-p., are now being made, three for driving torpedo-boat screws, and one for a dynamo. The total weight of the 1,200 h.-p. motor is 3½ tons, or about 6.6 lbs. per b.h.-p. For these high-speed turbines special qualities of steel are necessary. Great care is required in balancing the parts and to minimize vibration; the bearings of the shaft also demand special attention.

*A. Rateau in the Revue de Mécanique, August, 1900, p. 167. Also report of Congrès de Mécanique, Paris, 1900. Abstracts of papers, Inst. C. E.

American Bridges in India.

Sir Guilford Molesworth, who has long been Consulting Engineer for the State Railways of India, and who has been distinguished in the profession for more than a generation, has recently written a letter to the London *Standard* on the matter of American engineering contracts in India. His letter is very interesting, as coming from such high authority, and is as conclusive as a document so short can well be. Therefore, we are glad to reprint it below:

"With reference to the article on the indictment of the Indian Railways for bad management and partiality to foreign engineering firms, by Sir Alfred Hickman, I shall feel obliged if you will bring before your readers the following extracts from letters which I have received from an engineer who is now engaged in the inspection of bridge work and railway material in the United States of America. The letters from which the extracts were taken are dated May 6 and May 16, 1901, respectively:

'I had an idea before I came out this time that the Americans made good but rough bridge work; but this is quite a mistake. The work is as well finished as any English work, and quite as good, if not better, than any turned out in England, both as regards workmanship, finish, and material. I am only now speaking of the ——Co., as they are turning out a splendid job in every way. . . . .. I have a good deal of testing, but luckily the steel is excellent, and there is no attempt to scamp in the shop. . . . The drawing office methods are excellent, and the way the drawings are made out and tabulated is most workmanlike.'

"After describing in too great detail to be reproduced here, the numerous and ingenious methods of economizing labor, and insuring good work (in which the Americans appear to be far more progressive than the majority of English workshops), the engineer writes:

" 'Live rollers are used very much, and ordinary rollers to every machine. Much fewer workmen are used, and they work much harder; they do not limit the output of a man as they do in England.'

"These remarks speak for themselves, coming as they do, from an experienced engineer, who for several years managed a large bridge building establishment in England. There is no doubt that the workshops of the United States can compete successfully with those of Great Britain, both as regards price and workmanship, but the secret of their success lies chiefly in their perfect organization and in the use of labor-saving appliances. The high rate of wages prevailing in the United States acts as a powerful stimulus both in the invention and in the adoption, of labor-saving machinery, to an extent that more than counterbalances it; at the same time they are not handicapped by any limitation of the output of the workmen.

"It is childish to raise the cry of partiality. The blame lies partly with those who do not follow up the lead of the United States in adopting labor-saving appliances; but chiefly with those who, for political purposes, connive at the insane policy of trades unions in limiting the output of the British workman."

Metropolitan District (London).

Some weeks ago we printed some of the remarks made by Mr. Forbes (Chairman) at a recent meeting. From a later report we take the following:

By arrangements finally arrived at and now before the meeting, the proposals which were disliked in the bill as formerly presented would be abandoned. They had met with gentlemen of reputation, acknowledged ability, and with financial means. These parties had bought an enormous percentage of the ordinary share capital, and they were now masters of the situation. They had experience of electrical traction, and they felt assured that they could carry out the proposed changes on the District Railway. They had shown their faith by taking up about half of the ordinary capital, and were ready to find the money to provide the necessary machinery. The matter was now all centred in the agreement between the company and the traction company, and on the part of the directors he advised the proprietors to confirm the proposed arrangements as a solution of the difficulties of the company.

The agreement had been the subject of mature deliberation; it divided itself into two parts, one being the generating station and the other the conversion of the railway "from its present state of desolate waste of darkness into a gallant galaxy of light." The generating station they proposed to provide under one contract. It was to be erected by the parties in question, who would select firms to do particular kinds of the work, the object being to carry out the whole at the lowest cost, and the railway company were to have a voice in determining what was cost price. These gentlemen would not make any profit at all out of the generating station, which, on the completion of the works, would be hired to the railway company.

The contract for the electrification and equipment for working the line by electric power differed from that in relation to the generating station. For carrying out this work the Yerkes combination would take all that the railway company had to give. The directors had power to raise £500,000 of ordinary stock, which carried with it the power of creating £166,000 of debenture stock. The parties had agreed to take the £500,000 of ordinary stock at the nominal price of 25 per cent., and the debentures, which carried 4 per cent., at par. It was a great risk, and, moreover, they said they would carry out the conversion without interfering with the regular working of a single train. They would get very little out of the specific sums, and it appeared to him that their chief chance of benefiting was by increasing the value of their holding of stock owing to the improvements which would be brought about in the position of the company by the proposed changes. What they secured to themselves was a reasonable interest on the outlay. They were to find the money for the generating station, and any other money consequent on the contract at 5 per cent. These two things meant a 5 per cent. charge on the cost of the generating station, in the nature of a rental; and a 5 per cent. charge also on any money that was required to be expended over and above the £500,000 of ordinary stock and the £166,000 of debenture stock. The directors had had many discussions on the matter, and they had not been always agreed; but they had at length come to the conclusion that they could conscientiously put the proposals in question before the proprietors as the best possible solution of the difficulties of the concern. The board had enough proxies to carry anything, but what they wanted to see was the resolution agreed to unanimously by the proprietors present.

An extraordinary general meeting was afterwards held, at which resolutions were passed authorizing the exercise of the powers conferred on the company by sections 23 and 26 of the Whitechapel and Bow Railway Act, 1900, and by section 33 of the Brompton and Piccadilly Circus Railway (Extensions) Act, 1899.

The latest cable despatch is that an arbitrator has been appointed, by the Board of Trade, to decide between Yerkes and Ganz.

RAILROAD GAZETTE

ESTABLISHED IN APRIL, 1856.
PUBLISHED EVERY FRIDAY
At 32 Park Place, New York.

EDITORIAL ANNOUNCEMENTS.

CONTRIBUTIONS—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussion of subjects pertaining to ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

ADVERTISEMENTS—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

Railroad earnings, both gross and net, for April, according to the figures of the *Chronicle*, show the largest gains of any month this year. Returns from 133 roads give $11,611,000 gross earnings, a gain of 12.97 per cent., and $4,595,000 net earnings, a gain of 17.8 per cent. These figures follow large increases for the same month in 1900 and immediately preceding years. In net earnings for April, the Pennsylvania Lines, comprising those East and West, led with increases of $756,800. Other large gains were by the Southern Pacific, $729,900; the Illinois Central, $500,900; the Atchison, Topeka & Santa Fe, $443,500, and the Missouri Pacific, $403,600. The heaviest decrease in net earnings for April was by the Mexican National, $56,200. Among groups of roads the heaviest percentage of increase was made by the 17 Middle Western roads of 44.37 per cent., amounting to $629,600. The nine South Pacific roads gained 41.67 per cent., or $783,500, while the 19 Southwestern roads reported gains in net earnings of 39.87 per cent., with a total of $1,303,900.

In our issue of June 21, page 442, appeared an editorial article describing some of the work that is now going on in the direction of systematic study of timber decay and preservation. We said there that it is proposed to have sample ties treated, using a considerable number of ties for each process and for each kind of timber, and that these ties will be laid in the track in a region where heat and moisture induce quick destruction. We said there also that several of the railroads have undertaken to collect and transport the necessary number of ties and that the companies preserving ties will do their part of the work free. We learn now that at least half a dozen important railroads have joined in this project and will lay something like 5,000 ties in Texas during this summer. These railroad companies have also furnished sufficient money to enable Dr. von Schrenk to carry on certain further investigations in Europe. All of this is very encouraging and is certain to bring accurate results as soon as such results can be had.

The use of yellow glass for the lamps of fixed signals is steadily increasing, and we shall soon have a good body of experience with it. The latest installation is on the joint line of the Erie and the "Big Four" between Marion Junction and Galion, as described in our issue of June 21, page 433; and this example will be of particular interest because the yellow lights will be used under more trying conditions than they have been subjected to anywhere else. As is well known, doubt has been expressed, on all sides, whether a yellow which is dark enough to be quickly distinguishable from street and house lights would not under adverse conditions, such as a smoky or foggy atmosphere, be likely to be mistaken for red, and thus lead to confusion. It has been claimed that an engineman who should often find it difficult to decide whether or not a light was red would become careless and would put all reds and yellows in the same class; and thus would some time run past a stop signal, taking it for a distant signal. These doubts have always been answered by two arguments. First, a distant signal is invariably so situated that every engineman should know that it is not a stop signal, without regard to the color of the light. This it is that makes it practicable, in the thousands of distant signals in England, to have precisely the same night colors as the home signals have. Second, a red light need never be mistaken for a yellow, whatever we may say about mistaking yellow for red. This should obviate any danger of running past a stop signal. Well, the roads which we have mentioned are going to give up the first of these points and will depend entirely on the second. On the same post a yellow light will indicate "proceed to the next station," while red will indicate "stop." The glass to be used is not the same shade of yellow as that which has been used for several years on the New Haven road, being somewhat lighter; so that the present example will be doubly interesting to all who wish to see the most satisfactory solution of the problem of producing three good signal colors for night indications.

The paper by Mr. Valentine on telephones in railroad service which was read before the railroad telegraph superintendents at their annual convention is a valuable chronicle of experiences, in some respects unique, and we print the paper practically in full. Mr. Valentine's road, the New York, New Haven & Hartford, is, we believe, the only one in the country which has a Superintendent of Telephones, a circumstance which indicates the importance of that field of work in the company's operations; and the facts given in the paper are told with care. This gives to the author's recommendations a weight that those of a mere experimenter would not have, particularly as the New Haven is a very conservative company. The magnitude of the telephone business can hardly be appreciated except after considerable study, it has grown up so quietly. Sixteen hundred calls on one ticket office in a single day; a saving of the wages of two switching crews in a yard by stopping unnecessary switching and delays; complete abolition of the telegraph at an important terminal signal tower; these and other similar changes and economies are scarcely believable until one examines the situation in detail on the ground. As the New Haven and the Pennsylvania are the only roads which have developed their telephone service in just the ways mentioned by Mr. Valentine, the reader will have little difficulty in localizing the various features of telephone service that are described. Probably the only assertion which Mr. Valentine's hearers were inclined to classify as debatable was that about the use of the telephone for the transmission of train orders. He says that the supersedure of the telegraph by the telephone is no more radical than was the change from Morse registers to sounders. We are not sure that he is right about this; but whether the telephone is as good as its enthusiastic supporters claim, or is only partly satisfactory, we have no fear that it is going to hurt the telegraph fraternity. Improvements follow one another nowadays with bewildering rapidity, but there is no doubt the the despatchers and the telegraph operators will keep abreast of the times, and without sacrifice either of money or happiness.

To Raise the Efficiency of the Air Brake.

We spoke recently (June 21, page 442) of a movement to increase the price for cleaning brake equipment under the M. C. B. Interchange Rules. It will be noticed in the report of the doings of the convention at Saratoga that it was decided to raise the price for cleaning triple valves from 10 to 20 cents, for cleaning brake cylinders from 15 to 20, and to leave the price for cleaning retaining valves at 15 cents. The increased prices will go into effect September 1. The theory of the movement is that the prices now established will yield a small profit, at least to the Eastern roads; even at the new prices the far Western roads will probably make nothing. With only a small profit it will become an object for the car owner to clean these parts himself, also for those receiving foreign cars to clean them before they pass on.

The first result which is expected is an increase in the efficiency of the air brake apparatus on interchanged cars, and obviously there will be a corresponding increase in efficiency on the cars which stay at home. The next result will be an increase in the number, extent and efficiency of the plants for testing and inspecting air brake apparatus, and everybody who knows anything about the subject knows that there is ample room for improvement in all these particulars. It is a notorious fact that the air brake equipment on freight cars does not get reasonable attention either at home or on foreign lines, and a good deal of this comes from the further fact that the managers and officers who are responsible for expenditure are not willing to provide the men or means for proper inspection and care. The present action of the Master Car Builders' Association gives an excellent chance for the mechanical men to prod their superior officers by showing the immediate pecuniary gain of properly taking care of their own brake equipment.

We judge that the good results to flow from this movement are more varied and much more far-reaching than most people suspect, and indeed we are prepared to discover that it will do away with a large part of the trouble lately so much talked about from the breaking of chilled wheels under 50-ton cars; that is, it seems quite possible that such failures are mostly from ineffective control of trains by air brakes. The want of confidence in the performance of the air brake on freight cars, among some people, is still such that, in the East at least, it is not uncommon (perhaps on the contrary it is quite common) to let freight trains down steep grades by hand brakes. Of course we know what that must mean, namely, that the work is done by the brakes on a comparatively small number of the wheels in a train; hence, overheating; hence, broken flanges. It must not be understood that we attribute the chilled-wheel-50-ton car troubles altogether to this one cause; there are several, and to this matter we shall return in another issue; we are speaking now merely of the good results to come from keeping brake equipment in better order and to these we should add the saving of flat wheels also.

We hear two objections to the movement. First, that it will lead to cleaning parts when they do not need it; second, that it will increase the evil practice of stencil marking triples and cylinders as having been cleaned when they have not been cleaned. We do not attach much importance to either one of these objections; indeed the latter one seems too trivial to even mention it. If a man is rogue enough to mark a triple valve as having been cleaned when the price of cleaning is 20 cents he will so mark it when the price is 15 cents. Many an honest man may become a rogue for $20,000, but no one will be a rogue for 5 cents.

Another excellent result of this movement will be to make the owners of private cars pay properly for this part of the work which is done for them. This alone would be a great thing to have achieved.

At the Outset of the Engineer's Career.*

BY H. G. PROUT, C. E.

It is a pleasure to stand before this little band of survivors of a campaign of four years. I am told that you are less than 33 per cent. of the enrollment with your class, a percentage of casualties which justifies me in addressing you as veterans. Few persons have any adequate notion of the sustained fortitude which a man must have to go through four years of an engineering college and graduate with his class. In our Civil War the greatest loss in men killed suffered by any one regiment was 19.7 per cent. of the enrollment with the colors of that regiment; your loss is more than 67 per cent.; three and one-third times as great.

But further, it is an honor to be permitted to welcome you into the ranks of the noblest of the professions. When I say the noblest of the professions I do not speak lightly; I speak with a due sense of the meaning of my words and with due respect for my audience. The church can give us more examples of devoted lives. Medicine does more for the immediate relief of human suffering and perhaps does more of self-sacrificing charity than any other profession. The bar has furnished more of the constructive intelligence which has built the social and political system of the civilized world. All that is true. Yet when we mass the contributions of the engineer to modern society, when we consider the physical, the intellectual and the moral results of his work, we must conclude that his is the noblest of the professions. For example, Mr. Abram S. Hewitt, once said that Sir Henry Bessemer had done more than any other man to break down the prerogatives of the privileged classes of Great Britain; that Bessemer was the great apostle of democracy. I cannot stop to develop Mr. Hewitt's idea further than to say that Bessemer did this work by reducing the cost of steel and hence the cost of transportation. Thus he opened to the poor man the markets of the world for his labor and his food. So it has come about that you can get a loaf of bread carried from the fields of Dakota to New York city for one-third of one cent.

*An address before the graduating class of the Rensselaer Polytechnic Institute, June 19, 1901.

and so it has come about that the wages of one mechanic for one day will pay for the transportation of the food for one man for one year from Chicago to London. And let us consider for a moment the results of the engineer's contributions to sanitary science. The annual death rate in London in the last half of the seventeenth century was 80 per 1,000; now it is 20½ per 1,000. Again, in 1850, the median age of the white population of the United States was 18.6 years; in 1900, it had risen to 23, an increase of 24 per cent. in 50 years.

These are merely examples of the material contributions of the engineer to society; you cannot escape him. All civilization is dependent on his work. You cannot conceive of society without him.

But these are the material contributions. Beyond that are the intellectual and the moral contributions. I hold that there is to-day no other intellectual and no other moral training in the world so acute, so severe, so wholesome as the training of the engineer. This I know sounds extravagant, but again I speak with a full sense of my responsibility and after long deliberation. To this I shall refer later.

All of this is why I speak of ours as the noblest of the professions, and I am proud to be permitted to welcome you to it.

It is my purpose to speak briefly of three main topics—(1) of the training which you have received, (2) of the further preparation which you must now make, (3) of the relation to the profession which you must now begin to take up.

First, of the training that you have received: That is of the best quality, and the graduate of the Rensselaer Polytechnic Institute need not be afraid to stand before any group of men in the world. The history of our nation proves that. Look about you and you may see the story of the body of alumni into which you now enter written across the face of the land in railroads and bridges, in furnaces, steel mills and docks, in waterworks and in cities, and you may see it written even on the face of the oceans in the wakes of the great ships.

I am disposed to think that in some ways the training that you get here is even superior to that of many other schools, for a reason that is not always understood or appreciated. When the poet said "Sweet are the uses of adversity" he summed up in six words a great philosophical truth, and what I am about to say now is not calculated to help your President when he goes out asking for money for laboratories and shops, and I beg that you will not mention it outside of this hall. I suggest that the training of the Rensselaer Polytechnic Institute is better than that of most other schools of its kind, because of the comparative poverty of the Institute. The fact that you have not had here pattern shops and foundries, machine shops and laboratories on the grand scale of most of the big engineering schools has been, in a way, your good fortune. It has kept in force and has extended the original idea of the Institute, which is to make philosophers rather than to make artisans and machinists. The first force of the teaching here has always been on principles. Application has been permitted to come as it may. This, I judge, is the correct theory of an engineering school, and further, I take it that there will be a reaction from the over-development of the schools of application and a return to the methods of the schools of philosophy and principles. You know, when you stop to think of it, that if you are to go far you must have command of the principles of your art, and that if you have such command you can make your own applications. You know, for example, that if you are master of the principles on which retaining walls must be designed you need not cumber your minds or your note books with examples of other men's designs.

Observe, however, that I do not say a word to dissuade you from taking copious notes of other men's work. Quite to the contrary, I conceive that it will be of great use to you to cultivate the habit of observing and sketching examples of practice. But my point is that if you have not the principles underlying those examples, you will never be real engineers; you cannot originate; you cannot stand on your own feet; you will only be copyists and will soon come to the end of your rope.

What I am saying just here seems to me of so much importance that I venture to repeat it in other terms. Not long ago I was talking with a distinguished graduate and a former Director of this school, now the head of another engineering school. I asked him how it had come about that England had produced so many good engineers with no engineering schools. He answered quickly: "You must not forget John Macquorn Rankine." Another graduate of this school who has done some wonderfully bold and original bridge work and has put himself in the first rank of suspension bridge builders has often said to me that he never found himself in a place that he could not get out of with Rankine's "Civil Engineering" and Bartlett's "Mechanics." In other words, we keep coming back to the original proposition that if you are master of the principles of your art you can go as far as your natural abilities will allow. If you are not the master of those principles no knowledge of technique will ever make you an important engineer.

And so money will not make a university or an engineering college. Pattern shops and foundries, machine shops and laboratories will not make it. There must be a sound body of tradition and sound methods of teaching. This indicates the fundamental reasons why a new school cannot be as good as an old school, no matter how big its endowment. It does not follow that a school is good merely because it is old; it simply follows that mature age is a useful element in a school as well as in an individual.

There is another side to this question which I stop for a moment to suggest, not that I can suppose that it applies in any way to any one of you. Not every man is capable of mastering the underlying principles of the engineer's art. Not every man has enough brains to be an engineer; the average man has not. Most men must be content to work in the ranks; and so it is important that we should have the kind of schools which can make good draughtsmen and mathematicians, good instrument men and routine designers, men who can fill the great range of superintendents of shops and assistant engineers. But if we are to breed masters, we must also have the great philosophical schools. From such a school you graduate to-day. As years go on you will understand your good fortune as you cannot understand it now.

(2) I promised to speak of three things, the preparation that you have received here, the further preparation that you must now make, and finally, of your relation to the profession; we will take up now the second topic, and there as you will soon discover I have little that is new to say.

Your first lesson will probably be in measuring your own strength with that of other men. A good deal of this you have had in college, but now it comes in a different way. Heretofore the struggle has been to meet conditions already laid down. Now the field of your efforts is bounded only by your own abilities, and if I were to specify one quality more important than any other in the work now before you it is courage. The gods are always kind to the brave man.

We have assumed so far that you have learned the principles of your art. Beyond that we are justified in assuming that you have trained your powers of observation of analysis and of reason. You have now to ascertain and to prove that you have the courage to use your weapons. I should say that one of the great lessons of human experience is never to admit, to yourself or to others, that you cannot do the job that you see before you. If there is good reason why you should project an eclipse of the sun, do it; if you are asked to find the equation of the curve made by a ball rolling down the inside of a hollow sphere, find it; if you are asked to lay a 40-in. water main across the Hudson River, lay it; if you have a chance to conquer an empire, conquer it. Voltaire said: "All general statements are false and probably this one is also;" so of what I am saying about the courage to attack anything that comes along—you will naturally work within reasonable human limits, knowing that probably there is not *one* Newton or *one* Napoleon among you. But my point is that more men fail from timidity than from too much courage.

But do not imagine that courage does not see the dangers of the enterprise; that would be mere stupidity or blind conceit. I have a friend who has risen fast, and now while still young he is the President of a great railroad. He said to me the other day: "I never yet undertook a big job without being scared." I answered: "You will succeed; I should be worried about you if you were not scared." Mike Murphy will tell you the same thing about athletes; the winners are the men who have enough nerves and enough imagination to be scared at the instant of going into action. But they have also enough courage to start and fortitude enough to break their hearts to win. In brief, courage to attack, fortitude to defend, patience to wait, these are the great winning qualities.

But I am talking generalities, and it is not for me to say even that they are glittering. Perhaps you would like to have me speak a little more specifically of your preparation. It has come in my way to know a good deal about the entrance of young engineers into railroad life. I have talked much of this with railroad men and have had some experience of my own. The sum of the testimony is that engineering schools are the best recruiting ground for railroad officers. But it is pretty well agreed that when the young men come out of these schools they cannot draw, they cannot use their mathematics, they cannot write an acceptable English document. Here again we are speaking in general terms, but probably we are not far wrong. Of the drawing it is too late to talk now. If you are not good draughtsmen it is not likely that you ever will be.

Of the mathematics I may perhaps say a useful word. It is not a question of higher mathematics, but of the every-day bread-and-butter mathematics. This is where the young graduate is deficient and where he can quickly supply his deficiencies. For example, not long ago I asked a young man who had graduated with distinction at one of our best engineering schools to convert kilograms per square millimeter into pounds per square inch. It was a case of some tensile tests. After a good deal of labor he presented to me the astonishing conclusion that the specimens had broken under a strain of 0.221468 pounds per square inch. You will observe that the precision was great, but that the error was greater. A few weeks ago a boy who had just ended his junior year in an engineering school had occasion to find the fourth power of some 16 or 18 quantities. He proceeded with misapplied industry and by brute force to raise each one of these quantities to the fourth power by the simple process of multiplication. His younger brother suggested logarithms, and the lads eventually got their quantities that way. But even then they did not do their work the quickest and easiest way. They made one separate operation for each quantity instead of tabulating the quantities and grouping the operations. But they might have done even better than this, for the limits of accuracy made it practicable to use a computation table and take out the quantities themselves almost as quickly as they could take out the logarithms. I well remember in my own case the delight with which I discovered, when I had a long column of quantities to compute, that the second difference was constant and that I could get each quantity by the quick and easy process of addition. But no hint of this was ever given to me in college. I should advise you to begin at once to learn the short cuts in computation and also to learn to use your sense as to the accuracy required in each operation, or possible in each operation. You must often have heard of the young engineer who paced the diameter of a circle and then multiplied the diameter by Pi carried to fourteen places of decimals to get the circumference. I have actually known an engineer to design a section of a rail with such precision that he expressed the width of the foot of that rail in six places of decimals.

I have spoken of the defective English training with which the young engineer is apt to start. This is more important than you are likely to suppose, and it is easier to correct. But first let me warn you against mere fluency in writing or speaking. That is likely to produce bad English and not good English. Not long ago a young man came to me for employment on my editorial staff. I said, "What are your qualifications?" "Oh," he said, "I can write very easily." I answered, "you are just the man I do not want. I want nobody who can write easily." Further, the same notion applies to speech. You will remember Carlyle's saying about the English, that of all people on the earth they are the stupidest in speech and the wisest in action. The harm done and the fatigue inflicted by fluency are such that I have often thought that it would be a blessed thing for humanity if we were all struck dumb for a year.

But a clear, simple, accurate and (if possible) distinguished English style is a precious possession to the young engineer, and it is within the reach of nine men out of ten. It will come from so saturating your minds with good English that bad English is offensive. It is a matter of taste, and there is no such thing as acquiring taste by rule; you might as well expect to become a judge of tobacco by talking about smoking. If then you wish to master a good English style, read good English; read little of it, but read it thoroughly and constantly, and never read anything else. Do not read the daily newspapers further than to get the sort of information that every intelligent citizen ought to have. Read the monthly magazines most sparingly, or not at all. But read the Bible. Here you have the noblest English and the purest English. Here you have some of the best poetry in the world. Carlyle says that Job is the greatest poem ever written in any language. Here you get stimulus for your imagination, and you get the spirit of reverence and devotion which lies beneath all great work. But aside from this, and to descend to lower considerations, the Bible is the most important and best known literary work in the world and most frequently quoted. An intimate knowledge of it gives you a useful intellectual stock. None of you could fall into the mistake of the Frenchman who quoted the phrase, "Man shall not live by bread alone," as being "those beautiful and touching words of Chateaubriand," yet many of my acquaintances are almost as ignorant as that Frenchman of the text of the Scriptures. After the Bible, Shakespeare should be read, and beyond that I would advise you to read frequently Abraham Lincoln's addresses and state papers, where you will get not only some of the best English that has been written within the last century, but some of the most important history that has been made. I would advise you also to read Huxley, as well for the form as for the thought, and "Robinson Crusoe" in your moments of diversion, and for fiction I would read Thackeray. And there your reading might well stop for two or three years if your lives are very full of work, as we all hope and suppose they will be.

(3) We come now to speak of the third topic, of your relation to your profession, and this is the most serious of all. You enter active life at an important period of our national history; there are those who would say the most important. This I cannot say. There are now before me men who had the blessed privilege of beginning work in the middle of the greatest war of modern times. They saw more fighting in one hour than occurred in the whole Spanish-American war. They saw twenty skirmishes, each one more serious than the battles of San Juan or El Caney. They remember the heartrending days after the second Bull Run and in the gloomy weeks just before Gettysburg. They saw a nation almost in despair; what a tragic time it was! And then, in the hour of triumph, they walked up Pennsylvania avenue with the armies of Grant and Sherman, bodies of veterans more redoubtable than any that had trod this planet since the days of Julius Caesar; and later they saw a great nation readjusting itself to new social and political conditions.

No, there have been other great epochs in the history of our country, but you are permitted to enter on your work at the beginning of one of the greatest. During your active lives our population will be doubled. That will mean more consumers, more producers and more competition. The opportunities will be multiplied, and so will the men who do the work. We shall become the greatest manufacturing nation, the greatest carriers of ocean commerce and the greatest shipbuilders. In all of this the engineer must supply technical knowledge. His work will not be as picturesque as in the past, but

there will be more of it, and it will be of even greater importance to society. But, further, the engineer will invade the field of administration. He will gradually take the executive offices in the railroads and in the great industrial corporations. For this there are several reasons.

First, the day of the scientific man has come, and the engineer will go to the front because of his technical acquirements. Second, his education and his experience develop those intellectual qualities which are required in handling great affairs, namely, observation, analysis and reason. But, third and most important, his education and experience will have developed the highest moral qualities. The engineer does not regard himself as a moral leader; probably he never thinks of that part of his work. But he is, and he must be, a moral leader, for his whole teaching and experience lead straight to absolute honesty of thought and purpose. If he is not fundamentally honest in his thought and conduct nature finds it out, and his dam goes out, or his bridge falls, or his machine fails. He cannot be a sophist and an engineer at the same time; nature does not permit it. I remember seeing the matter stated by Macaulay somewhat in this way: The man who reasons for some actual end in practice must be accurate. For disputation he needs no correct premises, and only so much logic that he will not be caught. I cannot stop now to expand this idea, but I leave it for you to meditate over. The more you reflect upon it the more clearly you will see that the engineer is a moral leader of the first importance by the very necessities of his calling.

Let me repeat my proposition: You come to active work just when the nation is entering on a new and great epoch. You are destined to lead in that epoch: First, by your specific scientific knowledge. Second, by the robust intellectual development that comes in the training for your profession. Third, by the grand moral discipline of the study and practice of your profession.

With this great opportunity comes a great responsibility; and let me warn you that if you shirk the responsibility you will also miss the best points of the opportunity. You are responsible, each within his own powers, for the dignity and power of your profession. Fortunately it happens that directly in proportion to the zeal and fidelity with which you serve the profession will be your fame and influence in that profession, and in such proportion will be the riches and the glory that will come to you. This again is a general proposition, certain to fail in many cases but true in a large way.

And how are you to serve that profession? There is no special recipe; the only way is by being brave and honest gentlemen and by using with diligence such faculties as the Lord has given to you. I will suggest one bit of experience which may be of a little use some time. About once in so often some one says that the engineers ought to adopt a code of ethics. He thinks a formal code would keep one engineer from stealing another engineer's job, or his glory, or something else that is his. It has fallen to my lot to advise on this matter officially, and I am glad to know that I have helped even a little to keep the engineers from adopting a code. My argument is that a code would bind the conscientious man and would not bind the roguish man or the man of coarse perceptions; the Ten Commandments, the common law and the usages of decent society are code enough for any man in any profession. I venture the proposition that the codes of the medical associations have done great harm to society by the protection that they have thrown around incompetent physicians, and they have hurt the profession more than they have helped it.

I judge that in the next ten years or so the social use of the professional man will be far greater than it has ever been in the past. To him society must turn for help in the great new problems raised by the combinations of capital and of labor. It is not likely that the law will find a way to stop these combinations; it is doubtful if it is desirable that they should be stopped; but they must be directed and perhaps controlled in some degree, and, as I look at it, the most powerful direction and control must be by the growth of the professional spirit in affairs.

But what is the professional spirit? The business man measures his success by the money profit that he makes. He may or he may not have produced a beautiful article or a useful article; he may or he may not have added to the health or the happiness of the group of people just around him. These considerations are secondary; the primary considerations are dividends. Mind I am not expressing an opinion or criticising motives; I am stating a fact. On the other hand, the primary consideration with the professional man must be the interest of his client, whether that client be a man or a city or a state. He can think only incidentally of his fees. In fact, much fine professional work—much of the work most useful to the world is done without any fees or money return whatever. Do you suppose that a sense of money to come or personal reward was present in the mind of Grant in the Wilderness campaign; or of Roberts when he marched to Kandahar; or of Sampson when he organized and maintained that magnificent and unprecedented blockade of Santiago? Do you suppose that Newton or Lord Kelvin worked for money or even for fame? Think of the multitude of commonplace men who are working all the while under the impulse of a great motive without knowing it. That, I think, is quite wonderful. Fortunately for the progress of the human race, man is endowed with a sense of duty, with a thirst for knowledge, with a desire for the approbation of noble minds. So the true professional spirit is evolved, and this spirit must save the railroads and the great industrial corporations from some of the disasters which arrogance and ignorance are provoking.

One word more, and I shall have done. I wish to say a word to again bring forward and to emphasize the idea which to me seems more important than anything else that I have said, namely, the idea that the one most precious quality is courage. Your best work, your only large work, must be done alone. You will use the skill, the learning and the wisdom of other men. That you must do if you are to go far, for there are hard and fast physical limits to what one man can do. But the constructive work, the organizing work, you must do alone. You will find that when the great solemn situations arise you must retire within yourselves and brood over them; you will find that in those situations no one can really help you much. You will find that ultimately you must rely on yourselves and on yourselves alone, and this takes courage. It often seems to me that one of the marks of genius is the capacity to retire and meditate. Surely one of the marks is self-reliance. If I were asked to name the greatest work ever done by man since he walked the earth I should not hesitate an instant; I should say that it is the Hebrew Scriptures. Nothing else has so profoundly influenced mankind, or so widely or in so many ways. But who produced the Hebrew Scriptures? Not the men who dwelt in the ports where the tides of commerce and travel flow; not the men who dwelt in cities; but the men who lived in the wilderness, on the great arid plains; the men who sat apart in vast solitudes, and to whom Nature herself was an enemy. It seems to me that this is a grand example of a truth that shines through all human history—that the constructive powers must work alone, that inspiration must be from within. This is what I have in mind when I come back again and again to the saying—courage and again courage, and always courage.

Gentlemen, I close as I began. I welcome you with all my heart to our noble profession, and I wish for you that which is now well within your grasp—prosperity, distinction and happiness.

NEW PUBLICATIONS.

Railway Mail Service. By George G. Tunell, Ph.D. 214 pages. Chicago: The Lakeside Press.

This is a careful, thorough and scholarly study of the question of what the Government ought to pay the railroads for carrying the mails. It is avowedly an argument for the railroads; but the author writes in a judicial frame of mind, and his statements of the arguments which are opposed to his own are so moderate and fair, that the reader feels that the presentation of the subject is impartial. The first 40 pages are taken up with a statement, made in behalf of the Chicago & North-Western Railway, which was presented before the Joint Congressional Commission on Postal Affairs in November, 1898. The next two chapters, and, indeed, most of the book, have appeared in the Journal of Political Economy, and Mr. Tunell says that much of his material has been appropriated by other writers without giving him credit. These two chapters are devoted to detailed examinations of the various arguments that have been made in Congress and elsewhere on the subject of mail-transportation rates; and the numerous incomplete, one-sided and misleading statements that have been made are analyzed. This phase of the subject must be already somewhat familiar to readers of the *Railroad Gazette* as the arguments of Mr. Kruttschnitt and others have been noticed in our columns.

The most searching chapter in the book is the fourth, which is a criticism of Prof. Henry C. Adams' discussion of the subject which was prepared for the Postal Commission and has been printed in the report of that body. Prof. Adams applies to the study of mail-rates various finespun theories of social science which, to the ordinary mind, appear academic, not to say pedantic and useless; and Mr. Tunell politely but forcibly controverts many of his assertions. This chapter is not entirely a criticism, however; for it is here that the author gives the conclusion of his whole study; the conclusion that passenger-train-mile earnings, passenger-car-mile earnings, and mail-car-mile earnings are the only practically available data on which to base a reasonable decision as to what the Government ought to pay the railroads. On the Chicago & North-Western the average earnings per mile of 60-ft. mail cars, 21.66 cents, are almost exactly the same as the average earnings of all passenger cars on that road; and on the Louisville & Nashville the difference is not great (18.79 cents for mail cars and 20.06 cents for passenger). It is shown that the three fast mail trains of the Burlington road, Nos. 7, 8 and 15, earn only 92 cents a mile, 17 cents less than the average earnings from all sources, of all passenger trains on that road.

Mr. Tunell devotes a dozen pages to a chapter exposing some of the nonsense of Mr. Cowles' "General Freight and Passenger Post," but the reader is not obliged to waste any time on it, as the first paragraph of the chapter warns him that Mr. Cowles' logic and data are both unreliable. Mr. Tunell closes his work with a dozen tables giving the most useful statistics on mail transportation.

Engineering and Maintenance of Way.—The Proceedings of the second annual convention of the American Railway Engineering and Maintenance of Way Association is ready for distribution. The volume consists of approximately 500 pages and contains the reports of the standing committees, the discussions thereon and a list of members. Each member is entitled to one copy bound in paper and may have additional copies at the rate of $2 in paper, $2.50 in cloth and $3 half morocco. The Secretary is L. C. Fritch, Esq., Monadnock Block, Chicago.

Central Station Experiences; a Series of Narratives of the Trials and Tribulations of a Steam Engineer While Learning to Run an Electric Station. Octavo, 106 pages, boards; illustrations. New York: The Power Publishing Company. 1901.

The plan and scope of this little book are suggested by the title page. It deals with a long series of more or less inconvenient things which may happen to a man not altogether experienced in central station work and management. The pamphlet is made up of chapters reprinted from *Power* and is illustrated by numerous sketches, some of which are humorous.

TECHNICAL.

Manufacturing and Business.

A. M. Rockwell is no longer connected with McCord & Co., of Chicago.

The H. W. Johns Mfg. Co., of New York City, has recently secured the contract for covering the cylinders, pipes and receiver at the Edison Portland Cement Co., Stewartsville, N. J., for the account of the Allis-Chalmers Co.

Bids were opened last week at the Department of the Interior for water-tube boilers for the new electric lighting plant. Four bids were received. The Heine Safety Boiler Co. bid $12,798; Babcock & Wilcox Co., $18,191; Oil City Boiler Works, $16,577; Aultman & Taylor, $18,500.

All the buildings of the new plant of the Carnegie Tube Co., Carnegie, Pa., which will be one of the most complete pipe mills in the country, are to be of steel frame construction. Wm. B. Scaife & Sons, Pittsburgh, Pa., designed the buildings and has received the contract for making and building them.

We are in receipt of a letter from R. G. Ward, Manager of Construction of the Cuba Company, at Ciego de Avila, Cuba, asking manufacturers and dealers in all kinds of railroad supplies, apparatus, fittings, machinery, etc., likely to be used in the building and operating of railroads to send to him catalogues and descriptive matter of their different devices. The Cuba Company is a corporation with a paid in capital of $8,000,000 formed to develop the island of Cuba by the building of railroads and otherwise, the immediate purpose of the company being to build a railroad from Santiago northwest 335 miles. Among those interested are Sir William C. Van Horne, Levi P. Morton, John W. Mackay and James J. Hill. This company will undoubtedly be large buyers, and every manufacturer and dealer should have their catalogues in the hands of this company. If they are sent by mail, sufficient postage should be attached, or if sent by express the charges should be prepaid, to ensure delivery.

Iron and Steel.

The Carnegie Steel Co. has leased the properties of both the American Steel Hoop Co. and the National Steel Co.

Francis W. Heisler, Purchasing Agent of the American Bridge Company, has tendered his resignation, to take effect July 1.

Charles B. Houston has resigned as president of the Tidewater Steel Co., of Chester, Pa. He is succeeded by George McCall.

The Shelby Steel Tube Co. has been sold to the United States Steel Corporation. The Shelby Co. had a capitalization of $6,000,000 preferred and $9,000,000 common stock.

A circular issued by the Girard Trust Company, acting as agent, announces the terms by which the Bethlehem Steel and Bethlehem Iron Company are to be taken over by the United States Steel Corporation.

The Everson Steel Corporation, with office at Charleston, W. Va. has been incorporated in West Virginia, with a capital of $3,000,000, by George F. Mercer, James T. Wakeman, George H. Everson, Pittsburgh, Pa., and Thomas E. Clark and Henry H. Goodman, of Bellevue, Pa.

Joseph McDonald, Assistant Superintendent of the Ohio steel plant, has been appointed Superintendent, succeeding his brother, Thomas McDonald, who now has charge of the plants of the National Steel Co. of the United States Steel Corporation. The changes were effective July 1.

The E. A. Henry Wire Co., the Cuyahoga Wire & Steel Co., and the Summit Steel Co., all of Cuyahoga Falls, Ohio, will be consolidated, the new company to be the Cuyahoga Steel & Wire Co. It will be incorporated under the New Jersey laws, and E. A. Henry will be president.

A New Steamship Company.

The United States & South American Steamship Co., with a capital stock of $1,000,000, was incorporated in New Jersey on June 15. The incorporators are: Reginald Jevons, Thomas E. Jevons, Frederick T. Busk and Paul F. Gerhard, all of Jersey City, and identified with the Lamport & Holt Line, which plies between New York, Montevideo, Pernambuco, Bahia, Rio Janeiro.

Buenos Ayres and Rosario. The vessels of this line are the steamships "Coleridge," "Buffoon," "Milton" and "Sallust," the first two carrying first and third class passengers.

Ventilation of Baltimore Tunnel.

The shaft in Wilson street, Baltimore, which ventilates the tunnel of the Baltimore & Potomac Railroad, running beneath the street, is being made taller. This shaft, which is of brick, 18 ft. square outside and 100 ft. high, has had 35 ft. taken off from the top; this being done, the destroyed part is to be rebuilt to a total height of 150 ft. 2 in. This ventilating shaft was built nine years ago. The upward current of air is maintained by a fan, at the bottom, revolved by an electric motor of 80 h.p.

Disinfecting Stock Cars.

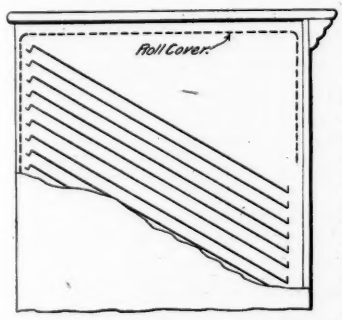
An Austrian railroad has been making experiments in the disinfection of stock cars with cold solutions of chloride of lime. Disinfection is required by law under many circumstances, and it has generally been effected, or attempted, by a steam process in Austria and by a carbolic acid solution in Germany and Hungary. The Hygienic Institute of the Vienna University reports that after modifying the processes in course of the trials, a solution of chloride of lime has been found which destroys the spores of baccilli which are most tenacious of vitality; and though complete disinfection cannot always be attained thereby, this is true also of the other processes. The chloride of lime process requires no special costly apparatus, no special training of the men applying it, does not affect the health of the men, does very little harm to the cars, and the odor soon passes. The use of a 5 per cent. solution is not dearer than the steam and carbolic acid processes now prevailing, and is much the cheapest of really effective processes.

Boston & Maine Shouldering Car.

The Boston & Maine shouldering car, which was described in our issue of May 25, 1900, is in constant use on the various divisions of the system. The car has been changed somewhat, but not materially from the original plans. To facilitate handling the cutters to and from the deck of the car and to help in removing the wings to load them on the car, a derrick has been rigged similar to the davits of a ship. Probably an air hoist will eventually be used for these purposes. The cutter is made of steel ¾ in. x 16 in. reinforced by 4 in. x 4 in. angle, and 3 in. x 6 in. channel iron, but it has been found necessary to have an additional strut to give the requisite stiffness when the wing is at its maximum reach. This strut has been arranged in a convenient way. The car is now being used for levelling back and pushing down the bank material dumped by a side plow in grading double track. The use of this car has reduced the force of shovellers about 50 per cent. On Sunday, May 12, the car did in four hours work which it would have taken 200 men a day to perform.

A Coupon Ticket Case.

Mr. C. P. Barrett, City Ticket Agent of the Delaware, Lackawanna & Western, at New York, whose new office is at 1183 Broadway, has a case for his coupon tickets which is a novelty in New York, in that it takes up no room at all—that is to say, it is beneath the counter, entirely out of the way. Each bunch of tickets lies on a movable tin strip 20 in. long, and this strip lies at a considerable angle from the horizontal; it is turned up at the bottom to keep the tickets from sliding off, and at the top it is bent over to afford space for a label. To take out a ticket the tin strip, on which is borne the form desired, is pulled up and out, and laid on the counter, where the face of the ticket can be conveniently read. The counter is 39 in. high, and the height of the space occupied by the tickets is 33 in., so that the upper end of the lowest ticket is a foot or more above the floor. The space under the counter, about 6 ft. long, is divided into four sections, and each section has room for 102 forms of tickets, there being 17 of the tin strips, one above another, in each tier, and six tiers. A rolling cover closes the case when not in use.



Progress of Simplon Tunnel.

Below is the report of the Federal Council on the construction of the Simplon tunnel in 1900. At both extremities of the tunnel the installations have been completed. The permanent ventilation system has been placed at the southern end, but at the northern extremity the building is not yet finished. However, in case of failure of the water power, the ventilation is assured by special machinery for use in case of emergencies. The progress of the work in the tunnel itself has been regular, and has kept pace with the contract. The result showed as follows on the 31st of December, 1900:

	Feet.
Tunnel No. I.	23,835
Tunnel No. II.	23,727
Complete excavating, No. I.	18,375
Complete covering, No. I.	16,049

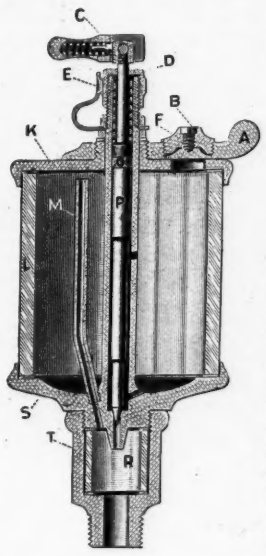
The advance during 1900 in tunnel I. amounts to 11,155 ft., which means for 360 days of work an average of 30.9 ft. per diem, against 31.4 ft. per diem in 1899. The average number of workmen in a day, in December, 1900, was:

About the tunnel	1,252
In the tunnel	2,663
Total	3,915

The expenditure for construction of the tunnel, including the lines of access—that is, for the track Brigue-Iselle—amounted in round numbers to 7,600,000 francs ($1,466,800) for the first year (ended Sept. 30, 1899) and to 18,000,000 francs ($3,474,000) for the second year (ended Sept. 30, 1900).

The Lunkenheimer Sight-Feed Lubricator.

An improved sight-feed lubricator, made by the Lunkenheimer Co., Cincinnati, Ohio, is here illustrated. The manufacturers have given it the trade name "Paragon," and designed it especially for use on gas, gasoline or oil engines, where it has proven very effective. Referring to the illustration it will be seen that the slide A screws down on the lid of the cup and has a loose plug which covers the filling hole when slide is swung over to a closed position. This loose plug is so arranged that the wear can be adjusted by turning down screw B. The whole construction is heavy, and the slide will seat and remain tight. The large filling hole is a desirable feature. The feed regulating mechanism is the same as in their "Sentinel" pattern oil cup, and the feed can be put on or off by raising or lowering the cam lever C. The rate of feed can be adjusted by turning nut D, which is prevented from loosening by spring E. The feed can be set and turned on or off without disturbing the rate of flow. The cup is thoroughly packed and cannot become leaky. The whole cup is secured together by patented lock-nut construction, which makes it impossible for the cup to jar apart and also dispenses with the annoyance of oil leaks. The sight-feed glass R is quite large and can be readily cleaned by unscrewing the upper part of the cup from the base piece. Where a heavier and more substantial cup is required the makers recommend the "Mars" pattern.



Interlocking.

The Commissioner of Railroads of Michigan has ordered interlocking signals to be put in in the city of Lansing, where the tracks of the Michigan Central and the Pere Marquette converge into the line used jointly by both companies. The order requires track circuit electric locks to be used, by means of which a train, having received and accepted a clear signal, automatically locks the levers of conflicting signals until it has passed beyond the interlocked limits.

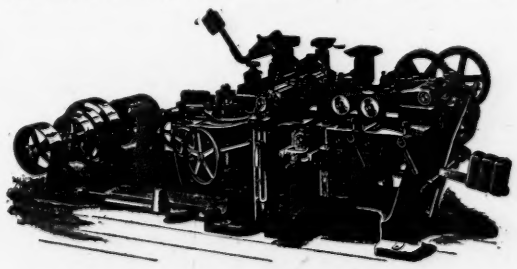
The Commissioner has also ordered complete interlocking at the crossing of the Grand Rapids & Indiana and the Pere Marquette at Kalkaska. This crossing has, heretofore, been only partly signalled, derails being provided for only one of the roads.

Interlocking has also been ordered at the crossing of the Grand Rapids & Indiana and the Lake Shore & Michigan Southern railroads at Sturgis, and at the crossing of the Grand Rapids & Indiana and Toledo, Saginaw & Muskegon at Cedar Springs, Mich.

Two crossings of an electric road in Flint, Mich., are to have derails at the crossings of steam railroads. The State Railroad Commissioner has approved the plans for these installations. The crossings are guarded by flagmen, and these men will attend to the derailers. The Commissioner has also approved a similar safety appliance at the crossing of the Harbor Springs Railway, and the Grand Rapids & Indiana, in the village of Harbor Springs. In this case there will be derails, but no signals in the track of the first named road, and signals but no derails in the track of the G. R. & I.

A New 9-in. Moulder.

The engraving shows a new machine made by the J. A. Fay & Egan Company, designated as No. 14, 9-in. standard moulder. It is believed that this tool will do more work and better work than anything of the sort that has yet been brought forward. A few of the advantages claimed for it are that the lower head cuts first; the table at the feeding-in end is adjustable independently; all of the pressure bars can be instantly thrown back, giving free access to the heads; the main head has an outside bearing and the lower head and its bearings draw out endwise for setting or sharpening knives; there is a countershaft at the feeding-out end, and there is no rubbing of belts.



THE SCRAP HEAP.

Traffic Notes.

Chicago papers report that there is considerable secret rate cutting on merchandise shipments westward from that city. Traffic is now rather light.

The receipts for immigrant traffic by the 30 railroads reporting this business to the Western Passenger Association amounted, during the first four months of this year, to about $43,000 more than during the same period of 1900, the figures being in 1901, $224,452; in 1900, $181,322; in 1899, $128,576.

Railroads carrying grain to the Gulf of Mexico have reduced their rate from Missouri River points to 12 cents per 100 lbs. These roads are said to claim that last year they kept their rates too nearly up to the basis of the rates eastward to the Atlantic seaboard, and thereby failed to get their share of the export business.

The Official Classification, which governs the freight rates throughout the territory between the Atlantic seaboard and Chicago, north of the Ohio River, has been amended so as to produce a decided change in carload rates on bulky freight. By modifications in the minimum weights allowed for cars over 36 ft. long, the long standing abuse of carrying very large carloads for the same prices as those charged for smaller cars, will be curtailed, if not absolutely stopped. This action is in line with the recommendation of the American Railway Association at its last meeting. A sample of the changes may be seen in the following: where the minimum C. L. weight is 10 tons, a 38 ft. car must be charged at least 12 tons; 42 ft. car, 13 tons; 46 ft. car, 14 tons; 50 ft. car, 15 tons, etc.

For many years now the reporters have been working hard on a scheme for putting a good share of the passenger and freight solicitors of the country out of business in consequence of the very general consolidation of large railroads; for consolidations must, of course, make it unnecessary in many cases to solicit business where, before, the traveling agents were the most prominent railroad officers to be seen. But with all the talk the actual diminution in the number of traveling or outside freight and passenger agents has been small. At last, however, there has appeared one straw which, though small, seems to indicate an actual wind blowing in the desired direction; it is reported that the Great Northern has decided not to renew the leases of the city ticket offices which it occupies in places where it competes with the Northern Pacific. These two roads are now friendly, and the proposition is to combine their ticket offices. It is expected that the combination will also affect the Burlington road; that is to say, these three roads will, in all cases where practicable, have a union ticket office.

Illinois Central Pensioners.

The number of employees of the Illinois Central retired on pensions July 1, according to the announcement issued two months ago, is said to be about 200.

A Chicago Central Depot.

Nothing in the present service of the railroads entering Chicago can justify the appointment of a committee to report on the feasibility of making one central depot for passenger trains. If the thing were feasible it would still be undesirable, inconvenient and wasteful. To-day there are six passenger terminals in Chicago—all on the outskirts of the business district. A better or more convenient arrangement could not be devised, save for the river which interferes with getting to and from the North-Western depot on the north and the Union depot on the west. The Illinois Central drops passengers at Twelfth street, Van Buren and Randolph on the east, and the various roads running into the Dearborn street, Rock Island and Harrison street stations bring passengers to the south of the business district. The effect of having the depots thus distributed is to prevent a congestion of passenger traffic in any one direction. A central depot would be an intolerable nuisance. There is already too much congestion of business in the center of Chicago.—*The Record-Herald, Chicago.*

Atchison Employees' Reading Rooms.

According to the *Topeka Capital* the Atchison, Topeka & Santa Fe is going to put up four new reading rooms for its employees during the next six months. These buildings are to be at La Junta, Col.; Raton, N. M.; Woodward, Okla. T., and Gallup, N. Mex. The estimated cost of the four is $30,000. The reading and resting rooms for the employees of the Atchison are under the direction of Mr. S. E. Busser, who formerly was an Episcopal clergyman in Kansas. His office now is at Los Angeles. We judge, from the accounts giving this information, that the Atchison's employees' rooms are not connected with the Young Men's Christian Association. The number of club rooms of this kind now established is 19, in as many different towns. The libraries in these clubs aggregate 10,000 volumes. The rooms at many places are used for dances and other entertainments, and Mr. Busser occasionally provides a musical or literary entertainment by stopping off companies on their way to the Pacific Coast, which he is enabled to do at small cost by giving these entertainers their transportation.

Who Will Be Promoted?

An examination of the "Biographical Directory of Railroad Officials," with especial reference to the course through which the officers named therein have attained their present positions, reveals the fact that the operating department appears to present the greatest number of successful careers. There are approximately 5,000 names mentioned in the directory. Under a classification which includes the operating department, telegraph operators, clerks, brakemen and shop men, there appear to be over 1,700, or over one-fourth of the whole, who have entered the service in the department, and by far the largest portion of these, or over 600, began as telegraph operators. There are also now filling places at the heads of their department, 166 who began as brakemen, and 62 who were originally firemen, about 400 who began as mechanics in the shops, and over 200 who were laborers. The general office and accounting department furnished about 1,100, the engineering department 900, and

the various clerical and subordinate positions in the traffic department about 850.—*Official Guide.*

A Hardy Perennial.

The press states that an English engineer has worked out a plan to connect Alexandria in Egypt directly with Shanghai. The railroad, which will be about 6,400 miles long, will have three divisions. The middle one, of 2,125 miles, is already in existence; it is in the railroad net of India. . . From Shanghai to Chungking, the road will run along the Yangtze Kiang, touching all important trade centers such as Nankin, Hankau, etc. Then it will run by way of Shantung, Yunnan, and Talifu to Kunlog, the most eastern terminus of the India roads. A road will connect Mandalay and Calcutta. Karache, at the mouth of the Indus, will become one of the principal stations. It is stated that work on the road will soon be commenced.—*Consular Reports.*

This lovely perennial usually blooms most profusely about August 15 to 25; but it may be relied upon the year around. Indeed, we frequently meet it in midwinter. The last sentence appears usually in mid-summer, but the climate of Frankfort (from which this specimen comes) is somewhat forcing.

Neatness and Taste on a Railroad.

An unexpected officer of the New York Central is a landscape gardener. It will be his business to lay out lawns and gardens, plant trees and vines and shrubbery, and hide, so far as he can, the desolation that used to prevail about the stations. This is new, but not surprising conduct. Public taste is no longer content, or complacent, under things it endured in the past. Much has been done to mitigate the monotony of journeys, but little has been done to soften the outward asperities of the railroad. Several roads have taken measures to better these conditions. They have put up signs advising idlers that they will no longer have sitting accommodations at the stations, they have offered prizes to station masters for the best kept buildings and grounds, and have ordered their track walkers to keep the way clean of old iron, discarded ties, tramps and rubbish. In at least one town the inhabitants have done their share in cleaning up the lands adjacent to the railroad, and have covered the fences with morning glory, so that instead of looking like a picture of distress a part of that town is a grateful surprise to the stranger. —*Brooklyn Eagle.*

The Uganda Railroad.

The British Uganda Railroad has reached mile post 501, making it much the longest line in tropical Africa—longer than all others put together. It is hoped to reach Lake Victoria Nyanza by the middle of next year, but there is some very heavy work on the uncompleted section.

Technical Schools.

Purdue University.—W. Kendrick Hatt, C. E., Ph. D., Associate Professor of Applied Mechanics in Purdue University, has been appointed Professor of Applied Mechanics. Prof. Hatt has become well known among railroad men through his writings in the *Railroad Gazette* and the experimental work which he has done for various committees of the M. C. B. and M. M. Associations.

CAR BUILDING.

The Pullman Co. is building eight cars for general service.

The Mexican Central is asking bids on 30 four-wheel cabooses.

Kerley Bros. are having 10 freight cars built by the American Car & Foundry Co.

C. W. Robinson is having two freight cars built by the American Car & Foundry Co.

C. B. Langhorn is having 16 freight cars built by the American Car & Foundry Co.

The Cline Stock Car Co. is having one freight car built by the Middletown Car Works.

Cape Breton Railroad Extension Co. has asked bids on 100 flat cars of 80,000 lbs. capacity.

The Colorado & Southern is having 50 freight cars built by the American Car & Foundry Co.

The Cincinnati, Hamilton & Dayton is in the market for about 500 box cars of 70,000 lbs. capacity.

The Kansas & Texas Coal Co. is having three freight cars built by the American Car & Foundry Co.

The Crucible Steel Co. is having four freight cars built by the Youngstown Car & Mfg. Co.

The Texas Central has ordered 10 ballast and one distributing cars of 80,000 lbs. capacity from Rodger Ballast Car Co.

The Mexican Central order with the Pullman Co., reported in our issue of June 14, calls for nine first class passenger coaches and nine third class coaches. The first class coaches will measure 59 ft. long, 9 ft. 8 in. wide and 14 ft. high. The third class coaches will measure 60 ft. long, 9 ft. 8 in. wide and 14 ft. high. The specifications for all include Player brake-beams, Westinghouse brakes, National-Miller combination couplers, Forsyth curtain fixtures for first class coaches, Pantasote curtain material, Soule dust guards, Baker heating system, Pintsch light, Sherwin-Williams paint, Standard steel platforms, Scott springs and Griffin wheels. Oil lamps will be used in the third class coaches.

The Mexican Central order with the American Car & Foundry Co., noted in our issue of June 14, calls for 300 box cars of 60,000 lbs. capacity, 50 coal cars of 80,000 lbs. capacity, and 150 stock cars of 60,000 lbs. capacity. The box cars will weigh 29,700 lbs. and will measure 34 ft. long over end sills, 8 ft. 9 in. wide over side sills and 6 ft. 10¼ in. high from floor to car lines. The coal cars will weigh 33,500 lbs., will measure 34 ft. long over end sills, 8 ft. 10 in. wide over side sills and 4 ft. 3¾ in. high. The stock cars will weigh 29,700 lbs., will measure 34 ft. long over end sills, 8 ft. 9 in. wide over side sills and 7 ft. 4 in. high. Specifications for all include Pressed Steel bolsters, Player brake-beams, Westinghouse brakes, Trojan couplers, Wagner doors, Dayton draft rigging, Soule dust guards, Sherwin-Williams paint, Scott springs and Griffin wheels. National Hollow brake-beams are specified for 50 coal cars.

LOCOMOTIVE BUILDING.

The Minneapolis, St. Paul & Sault Ste. Marie is having four engines built by the Schenectady Locomotive Works.

The Indiana, Illinois & Iowa, we are officially informed, has ordered 10 locomotives from Brooks Locomotive Works instead of Baldwin Locomotive Works, as reported in our issue of June 14.

The Mexican Central has ordered four 6-wheel switching engines from the Pittsburgh Locomotive Works, and is asking bids on four additional switching engines and 15 consolidation engines.

The Illinois Central order with the Baldwin Locomotive Works, mentioned in our issue of June 21, calls for 15 10-wheel freight engines for December delivery. They will weigh 157,200 lbs., with 122,300 lbs. on the drivers. They will have 20-in. x 28-in. cylinders; 63-in. drivers; extended wagon top boilers with a working steam pressure of 200 lbs.; 304 tubes 2 in. in diam. and 13 ft. 11⅜ in. long; fire-boxes, 120 in. long and 32¾ in. wide; capacity for 5,000 gals. of water and 12 tons of coal. They will be equipped with Westinghouse air-brakes, Jerome packing, Ashton safety valves, Leach sanding devices, Nathan sight feed lubricators, French springs and Ashton gages.

The Boston & Maine, as we noted in our issue of June 28, has placed an order with the Schenectady Locomotive Works for 30 engines. Twenty-four of these will be simple wide fire-box consolidation engines for February, March and April, 1902, delivery. They will weigh 165,000 lbs., with 143,000 lbs. on drivers; and will have 20-in. x 30-in. cylinders, 60-in. drivers; straight-top radial stay boilers, 200 lbs. working steam pressure, 326 charcoal iron tubes 16 ft. long, 2 in. in diam.; carbon steel fire-boxes 102⅝ in. long and 65¼ in. wide; tank capacity for water 5,000 gals. and coal capacity 10 tons. They will have 2,860 sq. ft. of heating surface and it is possible that some or all of them may be made compound. They will be equipped with Westinghouse-American air-brakes, Sterlingworth brake-beams, Diamond S brake shoes, Tower couplers, Westinghouse draft gear on tenders, Hancock injectors, U. S. Metallic piston rod and valve packings, Ashton safety valves, "She" sanding devices, Michigan lubricators, Crosby steam gages, Standard Steel Works truck wheels, cast-iron tender wheels and cast-iron driving wheel centers. The other six engines are for passenger service and will be simple wide fire-box Atlantic type. They will weigh 154,000 lbs., with 85,000 lbs. on drivers; will have 19-in. x 28-in. cylinders; 78-in. drivers; straight-top radial stay boilers; 200 lbs. working steam pressure; 309 charcoal iron tubes, 2 in. in diam., 16 ft. long; Carbon steel fire-boxes, 92 in. long, 65¼ in. wide; 2,872 sq. ft. heating surface; tank capacity for water, 5,000 gals., and for coal, 10 tons. The special equipment will be the same as that for the 24 freight engines.

BRIDGE BUILDING.

ADRIAN, MICH.—Plans have been approved by the Railroad Commissioner for an overhead bridge to be built by the Toledo, Adrian & Jackson Railway over the Lake Shore & Michigan Southern, near the city limits of Adrian. The bridge will be 22 ft. high and the main span 43 ft. long. Plans are also approved for an overhead crossing of the same road over the Fayette Branch of the Lake Shore & Michigan Southern near Blissfield.

ANACONDA, MONT.—The Butte, Anaconda & Pacific will replace its bridge at Colorado street with a steel structure.

ANN ARBOR, MICH.—Plans are under consideration for a complete separation of the grades of the street crossings and the Ann Arbor Railroad.

BOSTON, MASS.—The city of Boston has petitioned the Harbor & Land Commissioners to approve its plans for the Broadway bridge across Fort Point Channel. A hearing will be given on the petition July 3.

CINCINNATI, OHIO.—The Board of Public Service has sold $50,000 of bonds for repairs to the Eighth street viaduct. The repairs will probably be made at once.

CLEVELAND, OHIO.—The County Commissioners, according to report, have decided to build a 170-ft. bridge over the Cuyahoga River in South Brooklyn to replace the structure which recently collapsed.

CONCORD, N. H.—The Concord & Montreal will build a 150-ft. skew bridge over the B. & M.

DARTMOUTH, MASS.—The Harbor & Land Commissioners gave a hearing last week on rebuilding the bridge over Apponagansett River in Dartmouth.

DAYTON, OHIO.—The People's Street Ry. has offered to pay $5,000 toward a new bridge over Mad River at Keowee street.

DETROIT, MICH.—Plans have been approved by the Commissioner of Railroads of Michigan for three overhead crossings of the Detroit & Chicago Traction Co. over the Michigan Central on Broadway or Beakes street, Ann Arbor, on the southwest side of Territorial road, Parma, and in the city of Albion. Plans have been submitted for an undergrade crossing of the Detroit & Chicago Traction Co. under the tracks of the Pere Marquette Railroad in Springwells, Wayne County.

FOND DU LAC, WIS.—The Chicago & Northwestern, according to report, will build a bridge over the Fond du Lac River north of Scott street.

FORT SCOTT, KAN.—We are told that bids will be wanted in July for a steel bridge 175 ft. long over Osage River, about 15 miles north of Fort Scott. Address the County Clerk.

FREDERICTON, N. B.—Bids are being received by the provincial Department of Public Works for the steel superstructure of Oak Bay bridge.

GASTORIA, N. C.—L. T. Nichols, General Manager of the Carolina & North West, at Chester, S. C. will soon receive bids for a steel bridge of 400 ft. over South Fork River, near Gastoria.

HACKENSACK, N. J.—The Bergen County Board of Freeholders, which a month ago voted an appropriation of $75,000 for bridges, on July 1, voted an additional appropriation of $10,000.

HAMMOND, IND.—The New York, Chicago & St. Louis contemplates building a 200-foot steel bridge over Calumet river. (See also Hegewisch, Ill.)

HEGEWISCH, ILL.—The New York, Chicago & St. Louis, we are told, has in contemplation a 200-ft. steel bridge over Calumet River. Bids will be asked when negotiations are arranged. (See also Hammond, Ind.)

KANSAS CITY, KAN.—The Kansas City & Leavenworth Electric R. R. will build a bridge over the Kansas River. The company recently secured its franchise.

KINGSTON, TENN.—The city will give $25,000 toward the bridge over Clinch River to be built by the Harriman Bridge & Terminal Co., and used by the Tennessee Central.

LILLINGTON, N. C.—The County Commissioners are considering building a steel bridge over Cape Fear River at Aversboro Ferry, at a cost of about $10,000.

MARSHALLTOWN, IOWA.—The Iowa Central, we are told, will soon want bids on three bridges. One over Lime Creek will have 120 ft. of truss and a 35-ft. girder; another over Timber Creek will be 120 ft. truss, and one over South Skunk River will be 140 ft. truss.

MONTICELLO, ILL.—At the Court House, July 10, contracts will be let for a 100-ft. highway bridge on stone masonry, also for a 70-ft. highway bridge on stone masonry. For plans and specifications address Ira O. Baker, Champaign, Ill.

NASHVILLE, TENN.—The Tennessee Central is considering bridging the Cumberland River.

NEW CASTLE (COSHOCTON COUNTY), OHIO.—The County Commissioners, we are told, are considering building a steel bridge over Kokosing River, to have three 60-ft. spans.

NEW YORK, N. Y.—The Municipal Council has authorized three new bridges over Gowanus Canal, Brooklyn Borough. They are at Union street, Hamilton avenue, and at Ninth street. The latter will be a bascule draw, costing about $70,000.

Bids will probably be wanted soon for the steel bridge over Bronx River at Eighth avenue, Borough of the Bronx. Estimated cost, $150,000.

OMAHA, NEB.—The South Omaha Pontoon Bridge & Ferry Co. has been organized and will build a pontoon bridge over the Missouri River at South Omaha. The company will have a steam ferryboat for use should the bridge break. Richard S. Berlin is President.

PARRY SOUND, ONT.—Bids are wanted for a bridge over the Seguin River at Cascades street.

PHILADELPHIA, PA.—A bill is before the Select Council authorizing the Pennsylvania R. R. to build a bridge across Filbert street, west of Fifteenth street, to connect the fourth floor of the Broad street station with the annex office building.

ST. THOMAS, ONT.—McCubbin & Bell are preparing plans for a 140-ft. steel bridge over Big Otter Creek, in the township of Middleton.

SWEDES FOREST, MINN.—Bids are wanted, July 11, by I. N. Tompkins, County Auditor at Redwood Falls, for a 218-ft. steel bridge over Minnesota River between Redwood and Renville Counties.

SYDNEY, NEW SOUTH WALES.—Bids are wanted for a bridge over Sydney Harbor, embracing a main span of not less than 1,200 feet in the clear, with sufficient approach spans to make up a total length of 3,000 feet. The headway to be 170 feet above high water of spring tides for at least the central 600 feet of the main span; but this may be diminished to 150 feet in the clear at the limits of the 1,200 feet fairway. The deck of the bridge is to include a double line of railroad, with two roadways, each of 30 feet, or one roadway of 60 feet, between curbs (embracing a double line of tramway) and two footways, each 12 feet wide. Full particulars may be obtained from the Under Secretary for Public Works, Sydney, N. S. W., or from the Agent General for New South Wales, Westminster Chambers, 9 Victoria street, London, S. W. Bidders to furnish their own designs. Designs and tenders to be delivered to the Under Secretary for Public Works, Sydney, N. S. W., not later than noon of Feb. 28, 1902. Copies of specification, lithographs and tender form can be obtained at the office of Mr. Percy Sanderson, British Consul for New York, 17 State street, New York. E. W. O'Sullivan, Minister for Public Works.

SYRACUSE, N. Y.—City Engineer Charles A. Sweet has plans and specifications prepared for two bridges over Onondaga Creek, one at West Belden avenue and the other at West Brighton avenue. The Belden avenue bridge will be a 70-ft. plate girder deck bridge with paved floor and stone abutments and cost about $14,000. Bonds will be issued.

WEST CHESTER, PA.—The County Commissioners are considering building a bridge over Chester Creek in Westown township, which was authorized by the Grand Jury in 1898.

WESTMORELAND, KAN.—Bids are wanted, July 13, by A. P. Scritchfield, County Clerk, for a steel bridge.

WILKESBARRE, PA.—The Keystone Improvement Co., of Hazleton, contractors for the Wilkesbarre & Hazleton Ry., will soon want bids for the bridges.

Other Structures.

CHERRY RUN, PA.—A new passenger station will be built here, where the Western Maryland connects with the Baltimore & Ohio. Plans are reported made.

CLEVELAND, OHIO.—A passenger station, 128 x 44 ft., will be built at Euclid and Weston avenues by the Pennsylvania.

HAMILTON, OHIO.—The contract for building the plant of the American Frog & Switch Co., is let to Cotterell Building Co. of Cincinnati. The main building will be 345x100 ft., the power house will be 32x54 ft.

HARRISBURG, PA.—Plans are reported about finished by Wilson Bros., Philadelphia, for the new passenger station for the Philadelphia & Reading on the East bank of the canal. The contract will probably soon be let.

HOUSTON, TEXAS.—The International & Great Northern will build an uptown freight depot.

KNOXVILLE, TENN.—According to report the contract for building the Southern Railway passenger station in Knoxville, will be let by July 15.

OSWEGO, N. Y.—The National Railway Spring Company will build an addition to its plant in this city. It will be on the north side of the present plant and will have 3,500 square feet of floor space.

PUEBLO, COLO.—The Riter-Conley Mfg. Company, of Pittsburgh, have the contract from the Colorado Fuel & Iron Company, of Pueblo, Col. The contract includes a open hearth steel plant, mill and foundry, requiring more than 10,000 tons of structural steel and plates. This is one of the largest contracts for steel and iron placed in Pittsburgh for some time.

SAN BERNARDINO, CAL.—It is announced that the Santa Fe Pacific has about finished plans for increasing the capacity of its machine shops in San Bernardino. Ten acres adjoining the present machine shops have been bought, and it is said the improvements will cost about $150,000.

STRUTHERS, OHIO.—The American Sheet Steel Co., according to report, will build three sheet mills at the Struthers works.

WASHINGTON, D. C.—The Navy Department has let a contract to Augustus Smith, of New York, for a coaling station on Narragansett Bay to cost $347,813.

WEST SUPERIOR, WIS.—The Great Northern has secured control of three miles of Superior Bay front, where it is said a large dock will be built.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad associations and engineering societies see advertising page xvii.)

Railway Transportation Association.

The summer meeting of the Railway Transportation Association will be held at the Cataract House, Niagara Falls, N. Y., on Wednesday, July 17, beginning at 10 a. m. There will be reports of committees on General Transportation Topics; Car Service; Interchange and Distribution; Tonnage Rating of Engines; and Loading Freight Cars to the Full Capacity. A cordial invitation is extended to railway officials interested in transportation subjects to be present at this meeting.

PERSONAL.

(For other personal mention see Elections and Appointments.)

—Mr. O. O. Esser, formerly a Division Superintendent of the Lehigh Valley, died June 26, at Tunkhannock, aged 51 years.

—Mr. Geo. W. Armstrong, of Boston, died at Center Harbor, N. H., June 30, from shock resulting from a surgical operation. Mr. Armstrong was President of the Armstrong Transfer Company.

—Mr. P. B. Winston, senior member of the firm of Winston Brothers, railroad construction contractors, of Minneapolis, died at Chicago, July 1, of heart failure. Mr. Winston was born in Virginia in 1844.

—Mr. W. R. MacInnes, recently appointed Assistant Freight Traffic Manager of the Western Lines of the Canadian Pacific, is a native of Ontario, having been born at Hamilton, June 7, 1867. He was educated at the Marlborough College, England, and entered railroad service in 1885 as a clerk in the purchasing department of the Canadian Pacific. Five months later he was made a clerk in the solicitor's office. In 1887 he became Chief Clerk in the General Traffic Manager's office. He became General Freight Agent of the lines west of Lake Superior in 1899.

—Mr. D. W. Cooke, whose appointment as General Passenger Agent of the Erie Railroad we noted recently, began his career as a clerk in the freight office of the Chicago & Northwestern in 1881. He later went with the Chicago, St. Paul, Minneapolis & Omaha as a rate clerk in the general passenger department. From there Mr. Cooke went to Dallas, Tex., in the same capacity, and remained there three years, after which time he went with the Wisconsin Central at Milwaukee. From the last named company he went to the Chicago Great Western, where he shortly became Assistant General Passenger Agent, and a little more than five years ago became assistant to Mr. Roberts, then General Passenger Agent of the Erie.

—Mr. A. E. Manchester, Superintendent of Motive Power of the Chicago, Milwaukee & St. Paul, was born at Beaver Dam, Wis., in February, 1847. Mr. Manchester's entire railroad career has been with what is now the Chicago, Milwaukee & St. Paul. He began as a machinist in 1864 at Portage, Wis. In the fall of 1867 he took a similar position at Minneapolis, remaining there until 1869, when he was appointed roundhouse foreman at Calmae, Iowa. This position he held until 1880, when he was transferred to Mason City in the same capacity and in 1887 he was made General Foreman of the locomotive department of the Iowa & Dakota Division. Two years later he was made Master Mechanic, and in 1893 he was appointed Assistant Superintendent of Motive Power, which position he resigned to assume his new duties on June 15, last.

—Mr. W. C. Brown, recently appointed Vice-President and General Manager of the Lake Shore & Michigan Southern, was formerly General Manager of the Chicago, Burlington & Quincy. He was born in Herkimer County, N. Y., July 29, 1853, and began his railroad career in 1869 on the Chicago, Milwaukee & St. Paul. In March of the following year he was made a telegraph operator, and in 1871 became night operator for the C., M. & St. P. From then until 1881, when he became Trainmaster of the Chicago, Burlington & Quincy, Mr. Brown was Train Despatcher on the following roads: The Illinois Central, the Chicago, Rock Island & Pacific and the Chicago, Burlington & Quincy. From Trainmaster he was promoted to be Assistant Superintendent, later becoming Superintendent of the Iowa Lines, and in August, 1890, General Manager of the Hannibal & St. Joseph and the Kansas City, St. Joseph & Council Bluffs. Mr. Brown was appointed to the position he now leaves, that of General Manager of the Chicago, Burlington & Quincy, on Jan. 1, 1896.

ELECTIONS AND APPOINTMENTS.

Boston & Albany.—Wm. Bliss, President of the Boston & Albany, who, since the lease of this road to the New York Central, has managed the road as agent of the N. Y. C., has retired from the position of agent, and Edgar Van Etten, Second Vice-president of the New York Central & Hudson River, will take his place. Mr. Van Etten will have general charge of the operating, mechanical and engineering departments, with headquarters at Boston.

Canadian Pacific.—W. B. Lanigan has been appointed General Freight Agent of the Western Division, with headquarters at Winnipeg, Man. F. W. Peters, General Freight Agent of the Pacific Division at Vancouver, B. C., and H. E. MacDonell, General Freight Agent of the Kootenay and Boundary districts at Nelson, B. C., effective July 1.

Chicago, Milwaukee & St. Paul.—G. N. Wilson has been appointed Assistant General Auditor. Mr. Wilson's appointment in no way affects Mr. Dudley, Assistant General Auditor.

Chicago, Milwaukee & St. Paul.—Owing to ill health A. B. Bridges, Assistant General Freight Agent, has been granted a six months' leave of absence.

Erie.—Charles R. Fitch, General Manager of the Erie Division, has also been appointed General Manager of the Ohio Division and the Chicago & Erie Railroad, with headquarters at New York. John C. Moorhead, heretofore General Manager of the Ohio Division of the Erie, has been appointed Assistant General Manager, at Cleveland, Ohio, and Albert E. Mitchell becomes Mechanical Superintendent at New York. The position of Superintendent of Motive Power, formerly held by Mr. Mitchell, has been abolished. George Van Keuren, heretofore General Superintendent, has been appointed General Superintendent of Transportation, with headquarters at Jersey City. Henry E. Gilpin has been appointed Assistant General Manager of the Chicago & Erie and the Ohio Division at Cleveland. George A. Thompson has been appointed General Agent, New York terminal of the Erie and the New York, Susquehanna & Western, succeeding Mr. Gilpin.

Georgetown & Western.—C. T. Williams has been appointed Superintendent, succeeding A. B. B. Harris, transferred to other service.

Kansas City, Fort Scott & Memphis.—J. S. Ford, Comptroller, has resigned.

Montana Central.—F. E. Ward, General Superintendent, has resigned, and the duties will hereafter be assumed by G. T. Ross, Assistant General Superintendent.

New York Central & Hudson River.—H. L. Ingersoll has been appointed Resident Engineer of the Eastern Division, with headquarters at New York, Francis Boardman becomes Assistant Engineer, and P. L. Wilson succeeds Mr. Boardman as Assistant Supervisor of Subdivision No. 1 (the Harlem Division), with headquarters at White Plains, N. Y.

New York, New Haven & Hartford.—J. H. French, Division Superintendent, with headquarters at Boston, Mass., has resigned.

Northern Pacific.—W. G. Pearce, heretofore Assistant to the President, has been appointed General Manager.

Pennsylvania.—C. M. Shaeffer has been appointed Superintendent of Telegraph, succeeding A. Hale.

Pennsylvania Company.—L. F. Loree has been elected a Director, succeeding Effingham B. Morris, resigned.

St. Louis & Memphis.—At a meeting of the Directors held in New Madrid, June 21, the following officers were elected: President, S. Brinkerhoff, succeeding Seth S. Barnes; Vice-president, J. W. Worst, succeeding C. M. Barnes; General Manager, Frank J. Cunningham, succeeding S. S. Barnes, and Treasurer, John A. Cunningham, succeeding Laura Barnes. I. H. Burgoon has been appointed Assistant General Manager at New Madrid, Mo. These gentlemen are all officers of the St. Louis, Cauthersville & Memphis. The position of Superintendent has been abolished.

Southern Pacific.—H. H. White has been appointed Acting Superintendent (Atlantic System), with headquarters at Houston, Tex., succeeding W. B. Mulvey, Superintendent, deceased.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ANN ARBOR.—Plans are under consideration for the separation of all street crossings of this line at Ann Arbor, Mich.

ARIZONA CENTRAL.—This company has been incorporated in Arizona, to build from Benson through Phoenix and Yuma to San Diego. It is said that the road will enter Benson over the Southwestern of Arizona. W. J. Tiffany, of Phoenix, is an incorporator.

ATCHISON, TOPEKA & SANTA FE.—An officer of the Gulf, Colorado & Santa Fe writes that engineers are making preliminary surveys from Navasota, Texas, toward Anderson. It is not settled just where permanent location will be made. The line is very short, not to exceed 20 or 25 miles, and is being built for the Texas Tie & Lumber Preserving Co., of Somerville, to reach timber. No definite conclusion is reached as to how the work will be done, which will not be determined until permanent location is decided. (June 21, p. 447.)

ATLANTA & BIRMINGHAM AIR LINE.—This company was incorporated in Georgia, June 28, with a capital stock of $500,000, to connect Atlanta, Ga., with Birmingham, Ala. The incorporators are: Joseph Kingsbury, L. B. Nelson, L. S. Roan, S. N. Evans, J. E. Van Valkenburg, M. J. McCord, E. P. Ansley, W. N. Hawkes, H. S. Collinsworth and J. I. Spalding.

BALTIMORE & OHIO.—Surveys are reported in progress for a line from Lodi, Ohio, on the main line to run north about 10 miles to Lester, on the Cleveland, Lorain & Wheeling, for a direct connection into Cleveland.

CANADIAN PACIFIC.—J. B. Pearce, President of the Norwood & Apsley, controlled by this company, announces that surveys are in progress with a view to early construction. The line is projected from Norwood, Ont., north to Apsley, 25 miles, and Dominion and Provincial subsidies have been granted. (Construction Supplement, March 8, 1901.)

The Manitoba Government has guaranteed, through the Premier, this company $75,000 in cash, and the company agrees to build extensions of the following branches: From Brandon, 42 miles northwest (June 7, p. 389); from Snowflake east 10 miles; from Wellwood, on the McGregor branch, west 10 miles.

CENTRAL OF GEORGIA.—Surveys have been completed and the line will probably be built this season from Cuthbert, Ga., north 22½ miles through Benevolence to the town of Lumpkin, on the Seaboard Air Line. The time for letting contracts is not determined. The grading will be principally earthwork and rather heavy. (June 21, p. 447.) The maximum grades are 1 per cent. and the maximum curve 4 deg. (Official.)

CHESAPEAKE & OHIO.—With reference to improvements between Richmond and Lorraine, Va., an officer writes as follows:

Second track from the west end of viaduct to the water works, two miles; will reduce curvature from 11 deg. maximum to 8 deg. maximum; will remove 457 ft. of wooden trestle, substituting fills.

Change of line at three-mile lock will eliminate a 109 deg. curve; will reduce maximum curvature of 14 deg. to 6 deg.; will reduce maximum grade westbound from 74 ft. to 26 ft. per mile.

Change of line at Westham will change existing alignment of seven curves of from 3 deg. to 13 deg. to tangent 4,003 ft. long and a 1 deg. curve 1,290 ft. long; the company also contemplates building two new passing tracks 2,700 ft. long each; new water station, and telegraph office.

Change of line at Lorraine substitutes a tangent 6,000 ft. long for two reverse curves of 6 deg. and reduction of grade 52 ft. to the mile to 7 ft. to the mile. (June 7, p. 389.)

CHICAGO, BURLINGTON & QUINCY.—The company is reported contemplating the building of a cut-off from Hastings, Iowa, northwest to Council Bluffs, shortening the distance by at least 12 miles. The line now runs west to Pacific Junction and thence north to Council Bluffs.

CHICAGO, MILWAUKEE & ST. PAUL.—Surveys are completed for the cut-off from Davenport, Iowa, southwest about 110 miles, via Muscatine, to Ottumwa, on the Kansas City Division. Cross-sectioning is in progress. (March 22, p. 209.)

CHICAGO, ROCK ISLAND & PACIFIC.—An officer writes that the company does not contemplate building either of the lines recently reported from the Gowrie-Sibley Division at Royal, Iowa, to Spirit Lake, or from the Winterset branch to Macksburg. (June 14, p. 421.)

CROWS NEST SOUTHERN.—The Government of British Columbia has accepted the agreement to build the line under the British Columbia charter and work is to be begun at once. This is the Canadian end of the line projected by the Great Northern from Montana. (May 31, p. 373.)

DES MOINES INTERURBAN (ELECTRIC).—This company has awarded the contract for grading the extension from Des Moines, Iowa, south four miles to the army post site, to S. H. Shugart, of Nevada, Iowa, grading to be begun within two weeks.

DES MOINES, IOWA FALLS & NORTHERN.—Condemnation proceedings are begun for right of way along land adjacent to the main line of the Chicago, Rock Island & Pacific in East Des Moines, Iowa. The road is projected from Des Moines to Iowa Falls, 70 miles. E. S. Ellsworth, of Iowa Falls, is President. (May 24, p. 357.)

DES MOINES, NEVADA & ELDORA (ELECTRIC).—The contract for grading between Des Moines, Iowa, and Nevada, 38 miles, was awarded to S. H. Shugart, of Nevada, June 21. Grading will be begun the latter part of July. H. H. Polk, of Des Moines, President of the Des Moines Interurban Ry. Co., is President. (June 14, p. 421.)

DES MOINES & SOUTHERN.—This company was incorporated in Iowa, June 22, with a capital stock of $250,000, to build from Des Moines southwest to the State line. The principal office is Des Moines. Surveys will be begun at once and it is stated that grading will be in progress within two months. The incorporators are R. W. Clayton, of Oskaloosa, and F. W. Cherry, of Creston.

DETROIT & TOLEDO SHORE LINE (ELECTRIC).—Maps have been approved by the Michigan State Board of Railroad Crossings for the proposed change of line near Slocum's Junction, Wayne County, necessitating an additional crossing of the Michigan Central at that point. (June 7, p. 389.)

FAYETTEVILLE & ALBEMARLE.—The plan is being revived for building this line from Fayetteville, N. C., west 33 miles to Southern Pines. J. C. Brown, of Southern Pines, is President. (Construction Supplement, March 8, 1901.)

FINDLAY & MARION ELECTRIC.—An officer writes that right of way is largely secured for this line, incorrectly entered as the Findlay, Upper Sandusky & Marion Electric (June 21, p. 448), from Findlay, Ohio, through Carey, Upper Sandusky and Marion, 48 miles. Building is to be begun soon and the road will serve a population of about 50,000. Ex-Lieutenant Governor Asa W. Jones, of Youngstown, Ohio, is President; Jason Blackford, Findlay, Secretary.

FORT PICKERING.—This company was incorporated in Tennessee, June 21, with a capital stock of about $10,000, to build a connecting line at Memphis from the plant of the Wabash Wire Screen Door Co., to connect with the Illinois Central and other roads, about 1½ miles. The Wabash Wire Screen Door Co. are the incorporators.

GRAND TRUNK.—An officer writes that the proposed alterations in gradients at Napanee, Ont., have been deferred for the present. (June 21, p. 448.)

GREAT FALLS & OLD DOMINION (ELECTRIC).—The necessary right of way is reported obtained for this line from Rosslyn, Va., to the Great Falls of the Potomac, 14 miles. Joseph S. Miller, Washington, D. C., is President. (Construction Supplement, March 8, 1901.)

GREAT NORTHERN.—Building is reported begun on the extension of the Dakota & Great Northern branch from Bottineau, N. Dak., to a new town 12 miles west, to be known as Souris. (Construction Supplement, March 8, 1901.)

See Washington & Great Northern.

GREAT NORTHERN OF CANADA.—A special meeting has been called by the stockholders at the company's office in Quebec for July 17, to authorize the issue of equipment bonds and to accept the act passed at the last session of the Dominion Parliament as to the ranking of the company's bonds; also to authorize the building of the fol-

lowing extensions: From Grand Mere or Garneau Junction to a point on the Lake St. John Ry., in the County of Portneuf, or the County of Quebec; also from Hawkesbury to South Indian. The stockholders may also be asked to authorize the issue of bonds on these extensions not exceeding $20,000 per mile. (Construction Supplement, March 8, 1901.)

GREENVILLE, NASHVILLE & CHATTANOOGA.—Contracts are to be let at once, according to report, for this line from Corinth, Miss., north about 20 miles to Hamburg, Tenn. F. L. Bates, of Greenville, Miss., is an incorporator. (Construction Supplement, March 8, 1901.)

HALIFAX & YARMOUTH.—Premier Murray, of Nova Scotia, has received an offer from the Dominion Securities Company, through William Seward Webb, of New York, to complete this line from Yarmouth along the Atlantic coast to Halifax, if the Nova Scotia Government will guarantee a subsidy of $10,000 per mile and the Dominion Government $3,200 per mile. It is proposed to buy the line now in operation between Yarmouth and Barrington for $1,000,000, and to spend $5,000,000 on the extension. It is also proposed to include the interests of the proposed line between Hawkesbury and Louisburg.

HARBOR SPRINGS.—An officer writes that this is a steam road projected from Harbor Springs, Mich., to Cross Village, 16 miles. All the work is being done by the company and eight miles was completed July 1. The maximum grade is 6 per cent., and the maximum curves are 60-ft. radius. The company is building its own rolling stock and locomotives. It is principally a lumber road, though freight and passengers are carried. Ephraim Shay is President, and Lette Shay, Chief Engineer. (June 14, p. 421.)

ILLINOIS CENTRAL.—An officer writes that there is nothing definite decided with reference to the spur from Parchman, Miss., to the new convict farm in Sunflower County. (June 21, p. 448.)

INTERNATIONAL ELECTRIC LIGHT & POWER.—This company has increased its capital stock to $250,000, to build from Redwood, on the Rome, Watertown & Ogdensburg to Alexandria Bay on the St. Lawrence River, eight miles. The company's office is Watertown, N. Y.

IOWA ROADS (ELECTRIC).—A company is being formed to build a line from Council Bluffs, Iowa, to Des Moines. Lyman Waterman, of Winterset, President of the New System Traction, recently organized, is interested in this line. The proposition is to build from Council Bluffs to Creston, there to make connection with the New System Traction line to Winterset and thence connect with the extension of the Des Moines Interurban from Des Moines to Winterset. At Des Moines connection will be made with the Des Moines, Nevada & Eldora Electric, thus forming one continuous line from Council Bluffs to Eldora, over 200 miles long. (New System Traction, May 31, p. 374.)

KINGSTON & PEMBROKE.—Surveys are in progress for the extension from Sharbot Lake via Lanark to Carleton Place, 41 miles, and building will be begun as soon as surveys are finished. (May 24, p. 357.)

LAKE ST. JOHN.—Surveys are being made for an extension of about 10 miles from Roberval to James Bay.

MANILA & DAGUPAN.—See Railroad News column.

MINNEAPOLIS, ST. PAUL & SAULT STE. MARIE.—An officer denies that the company proposes to build a branch line to Star Prairie, Wis., as reported. (June 21, p. 448.)

MINNESOTA ROADS.—T. B. Walker, of Minneapolis, is reported preparing to build a logging road 18 miles long, from Solway south to pine timber. Surveys are in progress under T. J. Kline.

MISCELLANEOUS COMPANIES.—The Dawson Ry. & Coal Co. was incorporated in New Jersey, June 28, with a capital stock of $3,000,000, to build railroads and to do a general mining business. The incorporators are: R. F. Harmon, New York; E. J. Patterson, Plainfield, N. J.

MONTGOMERY NORTHERN (ELECTRIC).—Surveys are completed for 60 miles on this line from Montgomery, Ala., via Wetumpka, Rockford, Goodwater and Ashland to Anniston, 100 miles. There will be one steel bridge of 400 ft., crossing the Tailapoosa River. (June 7, p. 389.) John W. Wall, of Montgomery, Ala., is President, and H. R. Golson, of Wetumpka, Vice-President. (Official.)

NEW YORK CENTRAL & HUDSON RIVER.—Plans have been filed for straightening the track in New York City along the north bank of the Harlem Canal between 192d street and Spuyten Duyvil. (May 24, p. 358.)

NORTHERN PACIFIC.—Notice has been filed with the Montana Secretary of State for the proposed extension of the Gaylord & Ruby Valley from Twin Bridges, Mont., south about 20 miles to Alder Gulch. (May 10, p. 324.)

Grading is reported begun on the branch from Scappoose, Ore. west 21 miles to Pittsburgh. (June 28, p. 474.)

OMAHA, COLORADO & CHICKASAW.—This company has been incorporated in Oklahoma Territory to build a line from Pueblo, Colo., southwest through Oklahoma to Fort Gibson in the Cherokee Nation, and thence to Fort Smith, Ark. W. S. Whittinghill, of Enid, is an incorporator.

OMAHA, KANSAS CITY & EASTERN.—The General Manager is reported as confirming the report that an extension is to be built soon from Quincy, Ill., east to Springfield. (Construction Supplement, March 8, 1901.)

OMAHA SUBURBAN RAILWAY & TRACTION (ELECTRIC).—This company has been incorporated in Neraska, with a capital stock of $500,000, to connect Omaha with South Omaha, Plattsmouth, Blair and Fremont. A. C. Foster is President; D. D. Richard, Vice-President, and T. W. Blackburn, Secretary and Treasurer. The central office is at Omaha.

ONTARIO ROADS.—A deputation has interviewed the Premier of Ontario, advocating Government assistance for a line from Teeswater, on the Canadian Pacific, to some point on Lake Huron, and thence along the lake to Owen Sound. The Premier is reported to have told the deputies that their request would probably be granted. Mayor MacKendrick, of Kincardine, is among those interested.

PANHANDLE TRACTION (ELECTRIC).—Engineers have completed surveys, and bids will be asked July 10, for this line, formerly the Northern Ohio Valley Electric (April 12, p. 259), from Wheeling, W. Va., north 16½ miles to Wellsburg. Howard Hazlett is President, and Robert Hazlett, Chief Engineer, both of the City Bank Building, Wheeling, W. Va. (Official.)

PARIS, CHOCTAW & LITTLE ROCK.—This project is being revived for a line from Paris, Tex., northeast toward Hot Springs and Little Rock, Ark. W. F. Gill, of Paris, Tex., is interested. (Construction Supplement, March 8, 1901.)

PENNSYLVANIA ROADS (ELECTRIC).—The Keystone Improvement Co. has about completed surveys for a line to connect Hazleton with Wilkesbarre, and contracts will be let as soon as possible. L. B. Stilwell, Park Row Bldg., New York, is Chief Engineer. E. S. Doud, of Hazleton, Pa., is President. (Official.)

PONTIAC PACIFIC JUNCTION.—F. H. Clergue, of Sault Ste. Marie, owner of the Algoma Central, is reported negotiating for a large interest in the Hull-Aylmer Electric and the Pontiac Pacific Junction, and proposes to extend the latter line to North Bay or to some other point on Lake Nipissing. The intention is to use the iron deposits near Hull. (Construction Supplement, March 8, 1901.)

PORTLAND CITY & OREGON (ELECTRIC).—Arrangements are being made, according to report, for extending the line south from Canemah, Ore., to deep water on the Willamette River. New incorporation was made in February. (Construction Supplement, March 8, 1901.)

PORTO RICO RAILWAY.—The Porto Rican Legislature has granted franchises which have been forwarded to Washington for approval, permitting this company to complete its circuit of the islands. (Construction Supplement, March 8, 1901.)

QUEBEC ROADS.—The Provincial Government has under consideration the granting of subsidies to the James Bay and the Quebec & Lake Shore; also to the Great Northern of Canada, for a branch from St. Francois du Lac to Nicolet, to connect with the Shore Line of the Intercolonial.

SABINE & NORTHERN.—This company was incorporated in Texas, June 24, to build the railroad from Sabine River, Orange County, north through the towns of Deweyville and Laurel east to the town of Newton, with a branch from Laurel to a point on the Gulf, Beaumont & Kansas City, at or near Baker, Jasper County. The principal office is Deweyville. The incorporators are: George W. Smyth, C. E. Walden and Frank Alvey, of Beaumont; J. B. Smith, R. F. Cheesman and John H. Seale, of Deweyville; W. A. Smith, W. J. Sanders, of Laurel, Tex., and J. G. Smith, of Uvalde, Tex.

SANTA MONICA, OCEAN PARK & REDONDO (ELECTRIC).—This company was incorporated in California, June 19, with a capital stock of $200,000, to connect the cities named, 15 miles. The principal office is Los Angeles. The incorporators are: Abbot Kinney, W. L. Graves, C. H. Stone, H. M. Wright and C. A. Summer, all of Los Angeles.

SIERRA OF CALIFORNIA.—Building is reported resumed on the extension from Jamestown, Cal., northeast through Tuttletown to Angel's Camp. There is about 12 miles to complete. Chas. Erickson & Co. have the contract. (Construction Supplement, March 8, 1901.)

SOUTHERN PACIFIC.—Surveys are reported in progress for shortening the line between Waldo, Texas, and Standart.

TOLEDO & CHICAGO TRANSFER.—Contracts are to be let at once, according to report, for this proposed line from Streeter, Ill., to Toledo, Ohio. A number of Indiana towns have granted subsidies. Among those interested are: J. A. Hamilton, White Cloud, Minn., and Wm. McIntosh, Goodland, Ind.

TOLEDO & INDIANA (ELECTRIC).—The company is reported to have obtained funds for building this line from Toledo, Ohio, to Bryan. C. P. Griffin is President; L. V. Brown, Secretary, and Geo. G. Metzger, Vice-President. The headquarters are Toledo. (June 21, p. 448.)

TOLEDO & SOUTHEASTERN.—This company was incorporated in Ohio, June 25, with a capital stock of $10,000, to build a line from a point on the Michigan-Ohio boundary in Lucas County, to a point on the Ohio River in Lawrence County, passing through the counties of Lucas, Wood, Hancock, Hardin, Logan, Union, Madison and Franklin. Chas. Hartman, Frank L. Mulholland, Lewis W. Morgan, C. H. Rauch and Charles E. Summers are incorporators.

WASHINGTON & GREAT NORTHERN.—This company has been incorporated in Washington by officers of the Great Northern, to build about 250 miles of line from Wenatchee north along the west side of the Columbia and the Okanogan rivers, crossing the latter river north of Ophir and thence along the east side to Osoyoos Lake, B. C., with a branch from the mouth of Bonaparte Creek east to Republic, thence to Marcus, thence up the Kettle River to Cascade City, B. C., to connect with the Victoria, Vancouver & Eastern. Contracts are reported let for a greater portion of the line between Marcus and Cascade City, and grading is in progress.

WASHINGTON, WESTMINSTER & GETTYSBURG.—The city of Gettysburg, Pa., has passed an ordinance granting right of way through the city for this proposed line from Rockville, Md., north 78 miles to Gettysburg, Pa. Jas. P. Colgrove, of Washington, D. C., is President. (Construction Supplement, March 8, 1901.)

WHEELING & LAKE ERIE.—An officer writes that the company will not build a branch to the Craig stone quarry in Ohio, as reported. (June 21, p. 448.)

WISCONSIN INTER-LAKES (ELECTRIC).—This company is being formed and will build an electric line from Kenosha, Wis., west. Surveys are completed and building is to be begun within 30 days. No contracts will be let. Patrick F. Haynes, of Kenosha, is interested.

WOODBERRY & NASHVILLE.—This company was incorporated in Tennessee, June 25, with a capital stock of $300,000, to build from Woodberry to Murfreesboro, on the Nashville, Chattanooga & St. Louis. J. T. Crass, of Chattanooga, is an incorporator.

RAILROAD NEWS.

BUFFALO & SUSQUEHANNA.—Announcement is made that less than $650,000 of 5 per cent. bonds are outstanding. The balance has been refunded into first refunding mortgage 50-year 4s recently bought by Fisk & Robinson. An additional $55,000 will immediately be retired by the sinking fund. (May 10, p. 324.)

CHICAGO, WESTERN INDIANA.—The directors at Chicago, on July 1, authorized a new bond issue of $50,000,000, which will be used in part to refund the old bonds; about $7,000,000 will be used for track elevation, and large sums for the purchase of additional property and for betterments. The company owns extensive terminals in and about Chicago which are used by other companies.

CHOCTAW NORTHERN.—This company, which is building a line from Geary, Oklahoma Territory, to Alva, about 100 miles, has made a mortgage to the Girard Trust Co., of Philadelphia, as trustee, to secure an issue of first mortgage 50-year 5 per cent. gold bonds, due April 1, 1951, at $12,500 per mile. The stock is authorized at $20,000 per mile, none being preferred. E. C. Ingersoll, of Girard Building, Philadelphia, is President, and J. Parke Hood, Secretary and Treasurer.

DULUTH, RED WING & SOUTHERN.—This line, extending from Red Wing, Minn., to Zumbrota, 25 miles, with three miles of branches, has been bought in the interest of the Chicago Great Western. The purchase is said to include a majority of the preferred and common stock, and the entire bond issue of $500,000.

MANILA & DAGUPAN.—H. L. Higgins, General Manager, is in Washington seeking information with reference to the claims for $2,500,000 of his company against the Government for damages sustained during the insurrection in the Philippines. Mr. Higgins is also seeking the privilege of building extensions and branches in different parts of northern Luzon, but these franchises can only be granted by Congress. (Sept. 21, 1900, p. 628.)

MINNEAPOLIS & ST. LOUIS.—According to a St. Paul despatch, announcement was made July 1 by this company that the property is to be taken over by the Illinois Central. The road comprises 642 miles of line, running from Minneapolis to Angus, Iowa, 260 miles; from Hopkins to Watertown, S. Dak., 215 miles; from Winthrop, Minn., to Storm Lake, 154 miles, and there are also two branches of 1½ miles each. It leases trackage from Minneapolis to St. Paul over the St. Paul & Northern Pacific, 10 miles. It also owns but does not operate a line from Albert Lea, Minn., to the Iowa State line, 13 miles, which is leased to the Burlington, Cedar Rapids & Northern, and from Minneapolis to White Bear Lake, 13 miles, leased to the St. Paul & Duluth line of the Northern Pacific. The capital stock is $6,000,000 common and $4,000,000 5 per cent. preferred non-cumulative. Full dividends on the preferred were paid during 1900 and since, and 1½ per cent. was paid in 1900, and 2 per cent. in January last on the common. It touches the Illinois Central at a number of points.

MISSOURI PACIFIC.—The stockholders, on June 26, authorized the increase of the capital stock from $70,000,000 to $100,000,000. (June 28, p. 474.)

PENNSBORO & HARRISVILLE.—This line, extending from Pennsboro, W. Va., to Harrisville, nine miles, is reported sold to M. K. Duty and others. The new owners are said to have under consideration extensive improvements.

PENNSYLVANIA.—The New York Stock Exchange has authorized the listing of $50,500,800 additional capital stock representing the amount recently sold to the stockholders. From the proceeds the company has paid off $21,000,000 of time loans made for buying stock in other railroad companies about a year ago. (June 28, p. 474.)

PHILADELPHIA & READING.—The Atlantic City has absorbed the Camden County, the Seacoast and the Ocean City companies. The capital stock of the consolidated company is $3,625,000, of which $1,000,000 is preferred. This preferred stock is to be exchanged for a like amount of Atlantic City R. R. Co.'s stock. The new common stock will be issued, dollar for dollar, in exchange for the common and preferred stocks of the absorbed companies. (May 31, p. 374.)

PITTSBURGH, CINCINNATI, CHICAGO & ST. LOUIS.—The first dividend on the common stock, 1 per cent., was declared last week, payable Aug. 15.

PITTSBURGH, SHAWMUT & NORTHERN.—With reference to the failure of Henry Marquand & Co., New York, which company held a large block of bonds of the P., S. & N., John Byrne, President of the railroad, is quoted as making the following statement

I am convinced that it will have no effect on the road beyond a little unpleasant notoriety. We sold our bonds and stocks to Marquand & Co., and were paid cash, and we are using the proceeds in completing the Pittsburgh, Shawmut & Northern road. The railroad company, as well as the mining company, can meet their obligations, which I consider is all the interest the public can have in them. (June 1, 1900, p. 364.)

SAVANNAH, FLORIDA & WESTERN.—The stockholders, on June 20, authorized the proposed increase of the common stock from $9,432,900 to $12,500,000, and the issue of $12,500,000 preferred stock without voting power. This is preparatory to the absorbing of the Charleston & Savannah, the Brunswick & Western, the Alabama Midland, the Silver Springs, Ocalla & Gulf and the Tampa & Thonotosassa. (May 31, p. 374.)

SEABOARD AIR LINE.—Vermilye & Co., and Hallgarten & Co. are offering at 102 and interest unsold balance of $8,000,000 refunding collateral trust 50 per cent. 10-year-old bonds. The proceeds will be used to retire immediately $3,400,000 of 6 per cent. certificates of indebtedness; to pay off one-sixth interest in the Richmond-Washington Co., to meet the car trust installments; to pay the floating debt, and to provide a fund of at least $1,000,000 for additions and improvements. (March 29, p. 230.)

TOLEDO, ST. LOUIS & KANSAS CITY.—Notice is given to holders of bonds or coupons entitled to the proceeds of the sale of the property and franchises of this company, to file the same with Irwin Belford, Special Master at Toledo, Ohio, on or before Aug. 1. (Feb. 22, p. 136.)

WHITE RIVER, LONOKE & WESTERN.—A decree of foreclosure was entered in the Pulaski (Ark.) Chancery Court June 20, against this company, whose line extends from Wooley, Ark., to Lonoke, 16 miles. The property was ordered sold by the Commissioner of the Court on Aug. 15.

WILLIAMSPORT & NORTH BRANCH.—Wilson & Stephens, of New York, are offering 4½ per cent. refunding first mortgage gold bonds due July 1, 1931, at 101½ and accrued interest, for delivery July 1. (May 24, p. 358.)